LIBRARY
MICHIGAN STATE COLLEGE
OF AGRI. AND APP. SCIENCE
FEB 13 1928

TWENTY-FIFTH YEAR

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

Vol. XXV. No. 2.
$2.00 a year. 30 cents a copy.

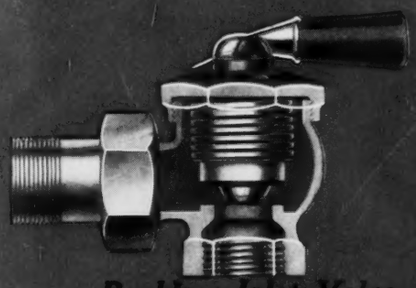
FEBRUARY, 1928

Heating & Ventilating Magazine Co.
386 Fourth Avenue, New York.

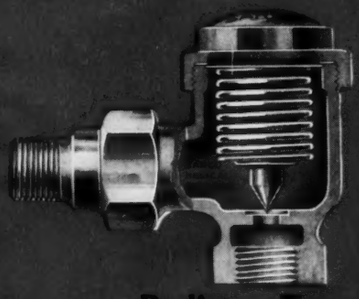
SARCO

Sarco Packless Inlet Valves and Thermostatic Radiator Traps use the unique Sarco helical tubing which has unusually heavy wall. Guaranteed for long life and satisfactory operation.

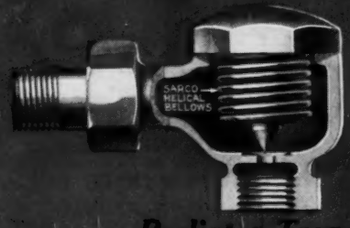
Write for new Booklet "P" covering all Sarco equipment for vapor and vacuum systems.



Packless Inlet Valve



Radiator Trap "H"



Radiator Trap "E"

SARCO CO., Inc.
183 Madison Ave., New York City
Branches in Principal Cities

PROGRESS

—a Summary of Recent Clarage Developments

DURING the last three years this company has pioneered on a scale without precedent in the fan equipment industry.

We have developed a new ventilating fan, new air washer, new high speed, forced draft blower, new unit heater, new unit humidifier, and a new general service exhaust fan.

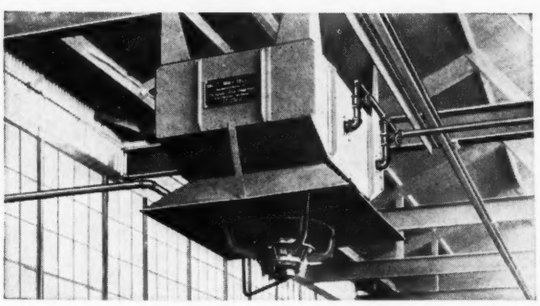
Today, when you specify Clarage, you have selected the most modern equipment of its kind—equipment offering basic improvements which make for a marked reduction in operating and maintenance costs.

Write for Clarage catalogs. Spend some time with us at the Chicago Power Show.

CLARAGE FAN COMPANY
Kalamazoo Michigan
Sales Engineering Offices in 25 Cities

CLARAGE

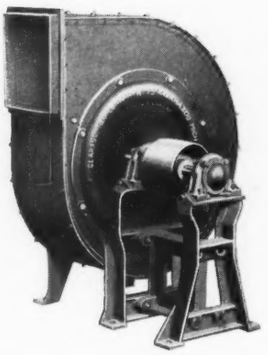
Fans—Air Washers—Unit Heaters



The New Clarage Unit Heater

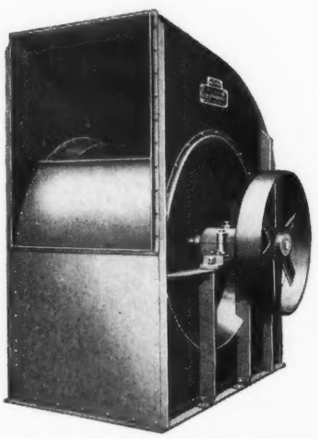
This unit heater is radically different. While it is common practice to deliver heat in only one or possibly two directions, the Clarage unit discharges heat at high velocity in *all* horizontal directions. More rapid, more efficient heating is the result. Buildings warm quickly—stay warm with minimum heat loss.

Clarage Unit Heaters are built for both ceiling and floor installation. First cost is low—decidedly less than direct radiation of equal capacity. Steam from any source can be utilized. Units shipped from stock. Patents pending.



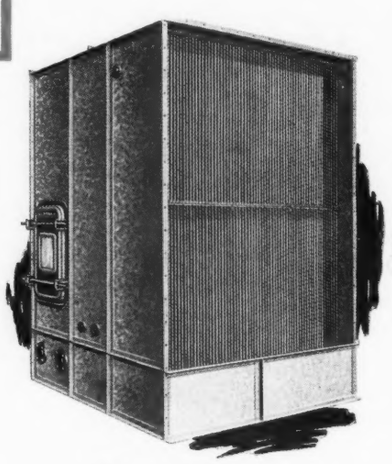
CLARAGE IMPROVED EXHAUSTER

New high efficiency plus universal application. Six different wheels interchangeable in same fan housing. Patents pending.



HV VENTILATING FAN

High efficiency of 77% (guaranteed) saves 15% to 20% in operating cost on any type of ventilation job. Sizes cover all requirements.



TYPE V AIR WASHER

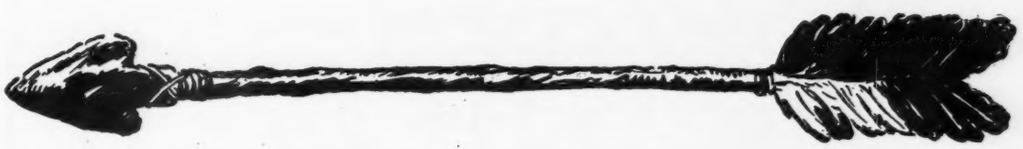
More effective nozzles produce unbroken mist screen at lower pump pressures and will not clog. One-man eliminator simplifies erection and saves money. Performance fully guaranteed.

AT CHICAGO POWER SHOW, BOOTHS 226 and 227

KEWANEE STEEL Riveted BOILERS

Low Heating Cost

Here are some of the features of boiler design which are necessary to insure lower heating costs: 1; a spacious firebox so that the fuel may be burned properly, 2; ample heating surface and long and numerous flue gas tubes permitting the heat of combustion to be transferred to the water in the boiler, 3; sufficient volume of water content to absorb the heat without undue disturbance, 4; good circulation of the water content to prevent steam logging, 5; area enough to permit liberation of steam at the surface of the water, 6; steam space large enough to take care of the fluctuations of load.



All these features and many more *are built in Kewanee Steel-Riveted Firebox Boilers.* They are a potential guarantee of low yearly heating costs.

And when you consider that *every year* a boiler's fuel may cost from ¼ to ¾ of its purchase price it is easy to see that a low heating cost is far more important than the first cost of the boiler.

KEWANEE BOILER CORPORATION

Kewanee, Illinois *Branches in Most Leading Cities*

STEEL HEATING BOILERS RADIATORS WATER HEATERS TANKS AND WATER HEATING GARBAGE BURNERS

THE HEATING AND VENTILATING MAGAZINE, published monthly by THE HEATING AND VENTILATING MAGAZINE CO., at 386 Fourth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXV, No. 2, February, 1928. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

For Greatest EFFICIENCY

STEEL HEATING BOILERS

In big buildings—where the economical burning of fuel means the savings of thousands of dollars every year—one invariably finds heating boilers of STEEL.

Efficiency records of more than 80%*—20% better than heating boilers generally average—are not uncommon with STEEL boilers.

For steel is the one material adaptable to boiler designs known to be most efficient. And this is but one of the reasons why nothing is as good as steel for heating boilers.

*In an actual "on the job" test, conducted under rigorous conditions, a steel heating boiler (Oil Fired) recently showed an efficiency of 83.05%

HEATING BOILERS DIVISION

The American Boiler Manufacturers Association

CHICAGO'S NEW GRAEMERE HOTEL

is also equipped with

TITUSVILLE BOILERS

The Graemere Hotel, shown above is the latest addition to Chicago's long list of fine buildings equipped with Tico Boilers including the Chicago Art Institute and the new Bankers Building. When you consider the importance of efficient and economical heating in modern buildings, especially where the comfort of tenants is of paramount importance to its success, these installations of Tico Boilers are a distinct compliment to Tico's long established reputation for dependable boiler performance.

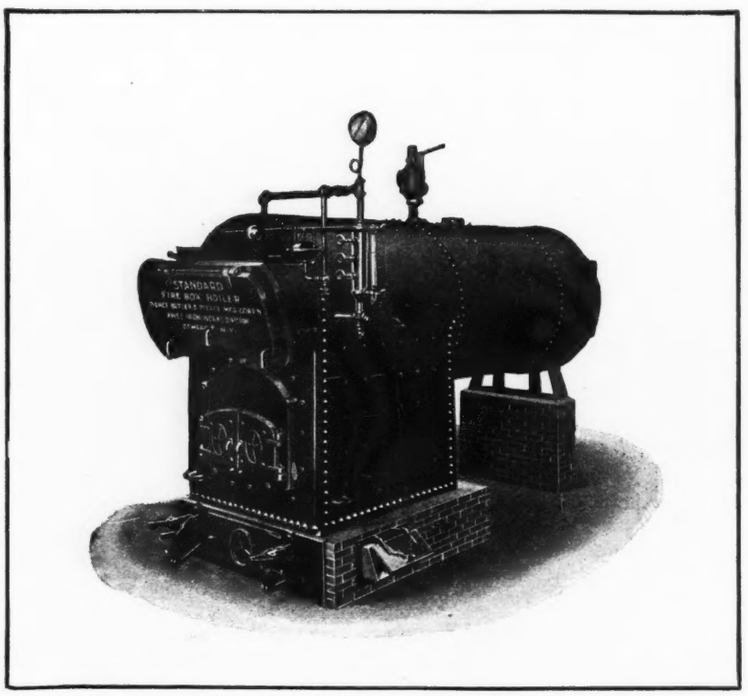
Sales Offices:

NEW YORK 152 W. 42nd St. | DETROIT, MICH. 204 Owen Bldg. | ST. LOUIS, MO. 401-2 Bk. of Commerce Co. Bldg. | BUFFALO, N. Y. Marine Trust Bldg.

PITTSBURGH, PA. Farmers Bank Bldg. | WASHINGTON, D. C. Woodward Bldg. | CHICAGO, ILL. 1124 Harris Trust Bldg. | LOS ANGELES, CALIF. 940 Maple Ave.

The Titusville Iron Works Company,
Titusville, Pa.

AMES



FIREBOX HEATING BOILERS

AMES IRON WORKS

Division of

PIERCE, BUTLER & PIERCE

MANUFACTURING CORPORATION

Main Office and Works

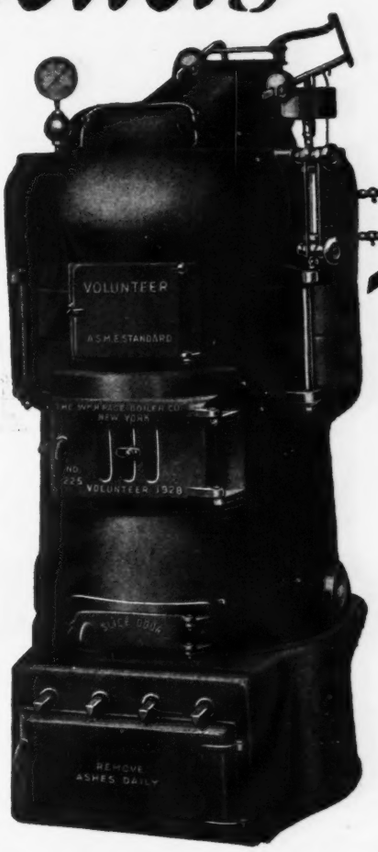
OSWEGO, N. Y.

General Sales Offices

41 EAST 42nd STREET, NEW YORK CITY

Page

New Series Volunteer Boilers



PRESENTING THE

NEW SERIES VOLUNTEER

"The Boiler with a Pedigree"

PRODUCT OF

America's Pioneer Boiler Manufacturer

The supreme combination of all the good features in boiler construction.

Send today for 1928 catalogue and prices, which are most favorable.

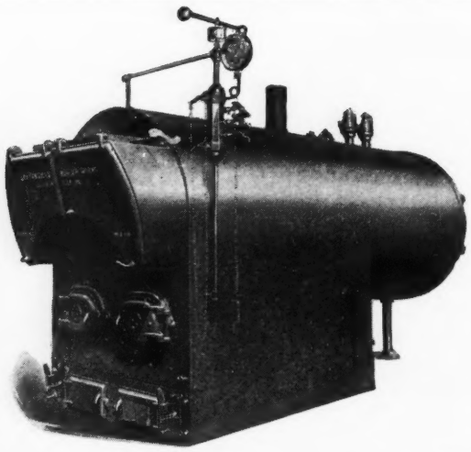
THE WM. H. PAGE BOILER COMPANY

Makers of a Complete Line of Round and Square Steam and Water Boilers

General Offices: 200 Madison Ave., New York

Branch Offices and Warehouses: BOSTON, 123 Beverly St.; CLEVELAND, Rose Bldg.; PHILADELPHIA, 1126 Washington Ave. BROOKLYN, 98-49th St. Factory: MEADVILLE, PENNSYLVANIA.

1892



1928

In 1892 we built one of the first ALL STEEL HEATING BOILERS

and we've been building them ever since

A Pioneer in the ALL-STEEL HEATING BOILER BUSINESS, we have consistently modernized and improved our product to meet the demands of the times. Today COATESVILLE BOILERS acknowledge no superior in Efficiency, Economy and Convenience. They are the "ULTIMATE" of a concern which has been building Power Boilers for nearly fifty years and Steel Heating Boilers for thirty-six years.

The present line of COATESVILLE ALL-STEEL HEATING BOILERS is available in Riveted or Welded construction for 15 lbs. working pressure, and in Riveted construction for 100 lbs. pressure. Special attention is directed to the fact that COATESVILLE WELDED BOILERS are "double-welded," i.e., welded inside and outside. This feature insures maximum Security and Service.

Some other features are: Adjustable Hinges (insuring tightness of doors)—Special Crown Sheet Construction (eliminating long staybolts)—Insulated rear combustion chamber.

"Be Convinced — send for Literature and Details."

COATESVILLE BOILER WORKS

Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.

Philadelphia	New York	Boston	Pittsburgh	Baltimore
111 S. 15th St.	30 Church St.	141 Milk St.	Union Trust Bldg.	Lexington Bldg.

Coatesville Boiler Works, Coatesville, Pa.

Gentlemen:

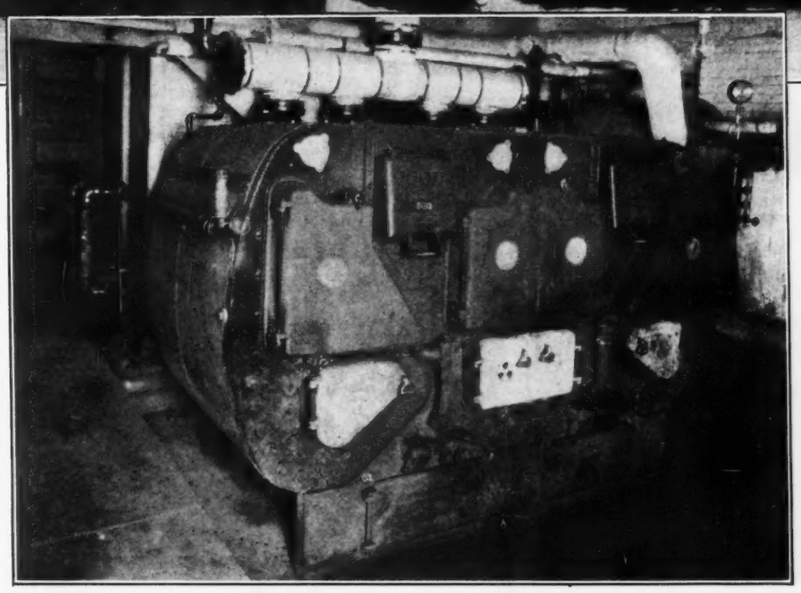
Please send me Literature regarding your All-Steel Heating Boilers.

Mr..... Title.....

Co. Name..... Street.....

City..... State.....

HV-2-28



REST FOR CONVALESCENTS
White Plains, N. Y.

Heating Contractor
CALLAHAN ENGINEERING CO.
White Plains, N. Y.

Heated by a No. 3-80 Spencer Steel Tubular Heater. Equivalent direct radiation 8000 sq. ft.

"A SIZE AND TYPE FOR EVERY HEATING REQUIREMENT"

Spencer
steam, vapor or hot water
Heaters
burn No. 1 Buckwheat Coal

SPENCER HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.
New York City Boston Philadelphia Baltimore Buffalo Rochester Hartford Albany Syracuse Scranton
Division of Lycoming Manufacturing Company

STEAM CAPACITIES: Cast Iron Sectional *from 600 feet to 3,200 feet.* Steel Tubular *from 2,000 feet to 16,000 feet*

INTERNATIONAL
ECONOMY SMOKELESS
BOILER

Efficiency *with any type of fuel*

Why they often Specify the Economy Boiler

Guaranteed Ratings remove guess work in selecting proper size.

Large combustion chamber and long flue travel assure complete combustion of gases, thoro heat absorption and a proper stack temperature.

Do not require expert fireman nor frequent attention.

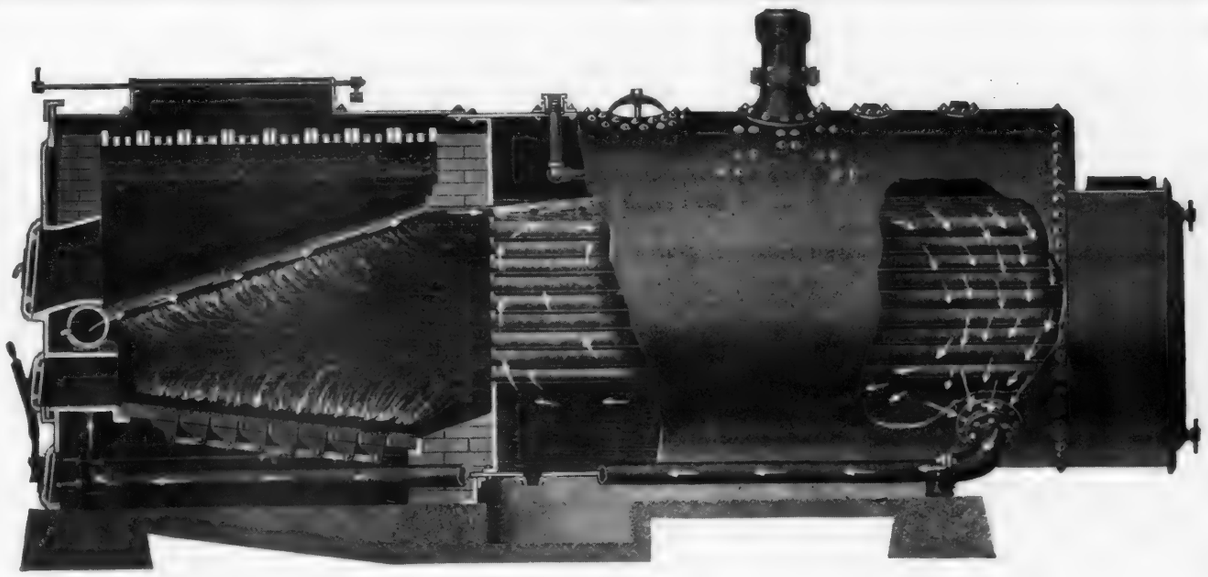
CUSTOMARY TESTS for a clear stack are regularly met wherever Economy Smokeless Boilers are installed. That is one reason why they are so often chosen for use in metropolitan areas.

This ability to comply with the most stringent smoke prevention ordinances is a planned result. It is the result of proper design which permits thoro mixing and burning of gases under proper control and utmost utilization of the heat generated. This assures efficiency at minimum cost.

Ask for catalog 1951-H.

INTERNATIONAL HEATER COMPANY
UTICA, NEW YORK

NEW YORK CHICAGO DETROIT CLEVELAND PHILADELPHIA NASHUA, NEW HAMPSHIRE



Boiler Value

BOILER value starts in the design and is ultimately resolved into gross power yield, less maintenance costs.

Stanwood Boilers give more steam per fuel cost because rapid and positive water circulation extracts a maximum of heat units from the gases before they are discharged into the chimney.

That also means quick steaming ability, conservation of time and ease of firing. That is the gross output with an insignificant maintenance cost to lower the net, for reasons recorded to the right. For more information write Dept. D-28.

Installation

The low water line of the Stanwood reduces necessity of excavation to a minimum.

Absence of exterior brick work lessens installation costs and minimizes losses from radiation in operation.

Maintenance

The Stanwood is easily and quickly cleaned.

The rapid circulation keeps sediment on the move.

There are no crown sheets to sag.

No mud legs to collect sediment.

No stay bolts to corrode and replace.

No fire-exposed circumferential seams to crack.

For Coal, Oil or Gas. 29 to 250 H.P. (3,500 to 31,000 sq. ft. steam radiation). Built for working pressures of 15, 100, 125 and 150 lbs. or higher if desired.

Stanwood Smokeless Boilers

All Steel Riveted Construction

THE STANWOOD CORPORATION

Manufacturers of Smokeless Boilers, Horizontal Return Tubular Boilers, Stacks, Breechings, Tanks, Feed Water Heaters and Throttling and Automatic Steam Engines.

Est. 1891 **Cincinnati, Ohio**

THE STANWOOD CORPORATION,
Dept. D-28, Cincinnati, Ohio.

You may send me full particulars about the Stanwood Boiler.

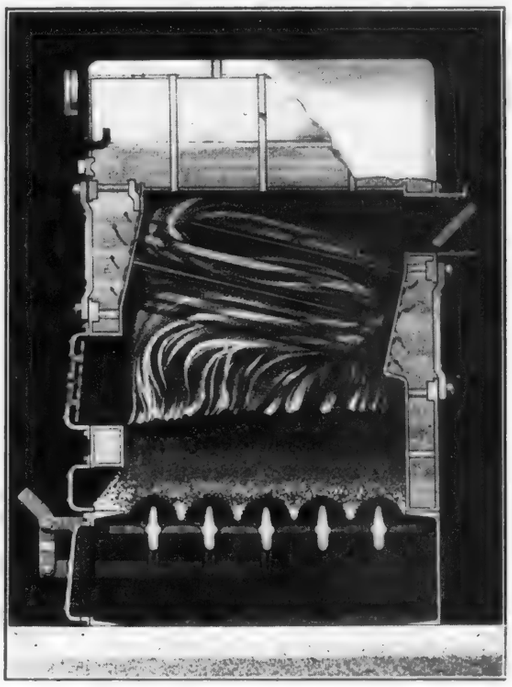
Name .....

Address .....

Business .....

Specify "KNOWLTON"—
THE BETTER BOILER

Coal—Oil—Gas



A REAL water tube boiler built of copper-bearing steel, electrically welded.

The "WATERTOOB" construction is

COPPER

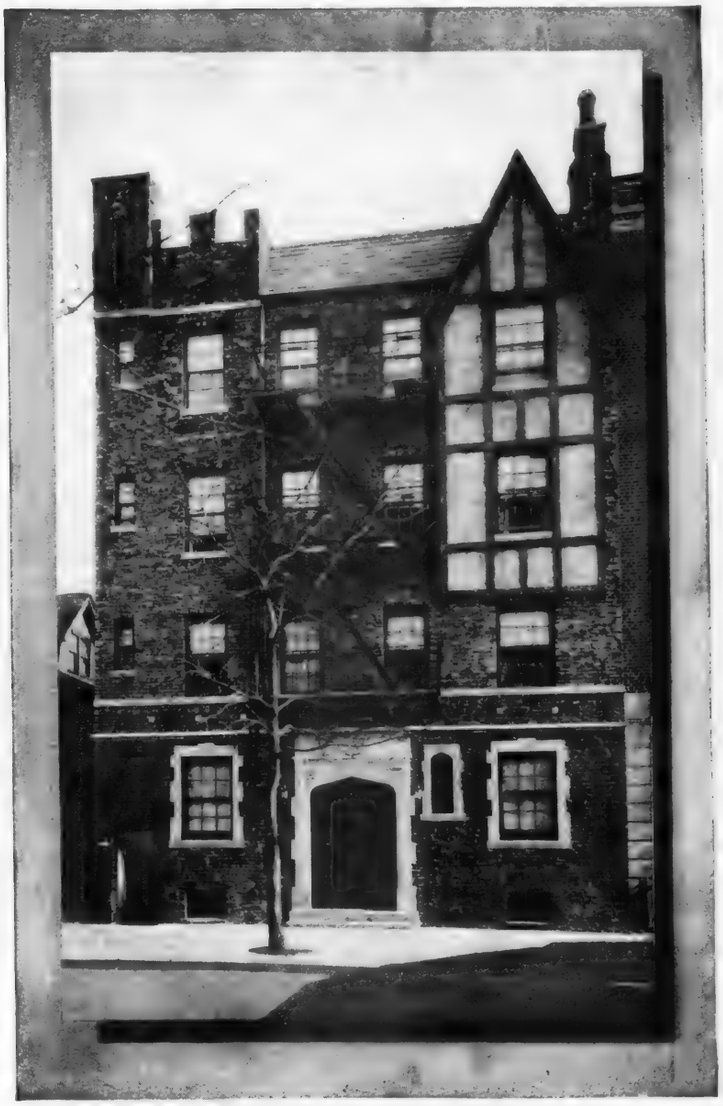
Maximum heat transmission throughout its long gas travel and rapid circulation. Result—highest efficiency.

These features guarantee Complete Heating Satisfaction to user and installer. Write us for complete information.

ORR & SEMBOWER, Inc., Reading, Pennsylvania

(Established Since 1885)

208 N. Clinton St., CHICAGO 50 Church St., NEW YORK



Anscot Apt.
Brooklyn, N. Y.

Owner
W. Stromwasser

Heating Contractors
Ashford Plumbing Co.
Brooklyn, N. Y.

In Installation of a Ross Steel Heating Boiler is the solution to the Problem in heating requirements -

Its Superior Design and Construction assures Lower Heating Costs

SEND FOR LITERATURE

Heated by one
No. 10 ROSS BOILER

MADE BY

The Frost Manufacturing Co.
SINCE 1851

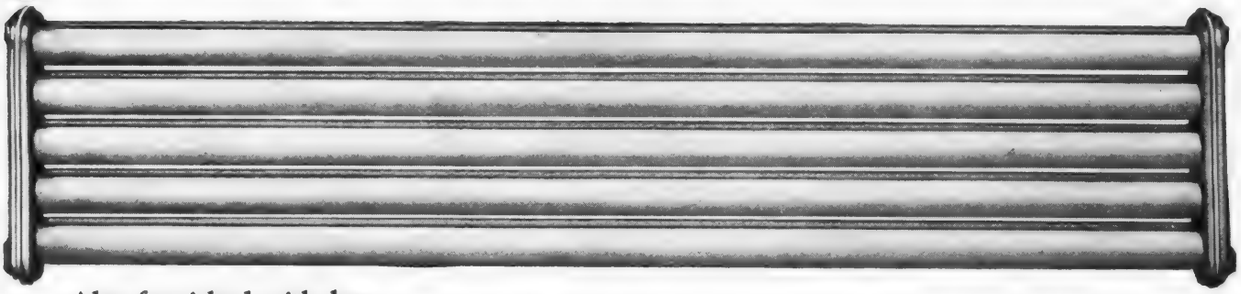
1520 Henderson Street, Galesburg, Illinois

77 years of active Boiler Building experience.
Branches in most leading cities.

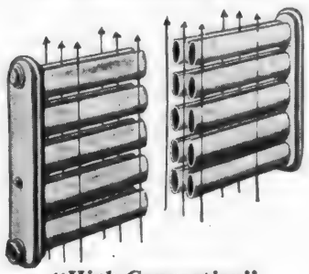
Eastern Distributor:
THE ROSS BOILER CO., Inc.
101 Park Ave., New York

ROSS STEEL BOILERS

The Modern Wall Radiator



Also furnished with legs for floor installation



"High Convection"

The Shaw-Perkins High Convection Radiator is all prime heating surface. The ingenious arrangement of the oval tubes allows the air to pass freely over the tubes, unimpeded by fins, baffles, or top and bottom hub connections, consequently the radiator has a high heat emission by convection.

Above view illustrates the high convection feature. Arrows indicate air travel. Note the absence of any impediments to free air circulation.

Shaw-Perkins
HIGH CONVECTION
Radiators

Low Narrow One-Piece Units As Long As 14 Feet

SHAW-PERKINS High Convection Radiators represent an advanced design in Shaw-Perkins standard oval tube radiation, which contains original and valuable features found only in this distinctive type of heating surface.

Light in Weight: The radiators weigh only one third as much as other forms of direct radiation. This absence of useless weight makes the radiators especially practical for suspension upon wall brackets. In comparison with pipe coils or sectional wall radiators, many joints and connections are eliminated and much labor saved by the use of Shaw-Perkins High Convection Radiators.

Heat and Cool Quickly: The light uniform walls of the radiators cause them to respond promptly to the turn of the valve, giving quick and positive control over room temperatures.

Save Space: The radiators save considerable space. While the radiators are built in several heights and numerous lengths up to 14 feet, the space saving is usually taken advantage of in the saving in height and width offered by the low narrow models.

Absolutely Sanitary: The radiators have no rough surfaces or fins to act as dust entanglements. All surfaces of the radiators are smooth and easily accessible for hand wiping.

Unusually Adaptable: The distinctive design and unique dimensions of the radiators make them remarkably suitable for installation upon walls, under windows, in recesses, upon columns, pilasters, etc. They are most desirable for heating Factories, Warehouses, Greenhouses, Garages, Theatres, Churches, Stores, Dwellings, etc. The radiators are also particularly adapted to various drying and cooling purposes and to many industrial uses.

Get the Full Story of this Modern Radiator

SEND FOR CATALOG "H"

Shaw-Perkins Manufacturing Company, Pittsburgh, Pa.

You have less sales resistance in selling Thatcher Round Boilers

A DEALER selling Thatcher Round Boilers meets less sales resistance due to their many advantages which enable him to make more sales and build profits.

Selling a Thatcher Round Boiler is selling *proven* performance. Known to the public for over three quarters of a century as a manufacturer of high-grade heating equipment, the name Thatcher has a valuable consumer acceptance. Many modern and exclusive features are contributing factors to the remarkable heating efficiency and fuel economy of this popular boiler.

THE "STAGGERED" FIRE TRAVEL which utilizes the hot gases and smoke, the sensitive and automatic drafts, checks and dampers, and the less frequent firing periods, due to the depth of the fire-pot, with its large coal carrying capacity, are the outstanding features of prime importance.

Write to have us mail you descriptive literature and trade information

THE THATCHER COMPANY
SINCE 1850

NEW YORK 21 W. 44th St. | NEWARK, N. J. 39-41 St. Francis St. | CHICAGO 341 N. Clark St.

THATCHER
BOILERS-FURNACES-RANGES

Read these other outstanding advantages

Quick steaming, due to equalization of grate surface, fire travel and water circulation.

Low installation cost, due to the construction of the boiler, making erection easy.

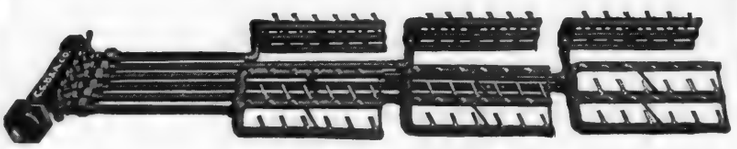
Easily operated triangular grates, which readily free the fire of clinkers and dead ashes.

The unusually high ash-pit, preventing the burning out of grates.

The large feed door, which permits easy firing and spreading of fuel to all parts of the fire.

Provision for domestic hot water system, so that ample hot water may be secured whenever boiler is in operation.

The construction makes it specially suitable for use with an oil burner.



Barber Patented Jet Gas Burners are designed for converting coal burning appliances over to use gas economically. They are easy to install and can be supplied for practically every size and type of furnace or boiler. Above is the correct Barber Burner for the installation shown below.

Doing a Better Job of Heating WITH GAS

Everyone is agreed that gas heating is unsurpassed for clean, easy and efficient heating for any type of building whether home or commercial establishment.

The point that has caused so many to hesitate about heating with gas is the "expense" item. Many people think that a complete change of the heating plant is necessary but if a Barber Burner is used, it can be installed in the present furnace or boiler and in a few hours, at but very small cost. Any building can be equipped for the enjoyment of the comforts of gas heat.

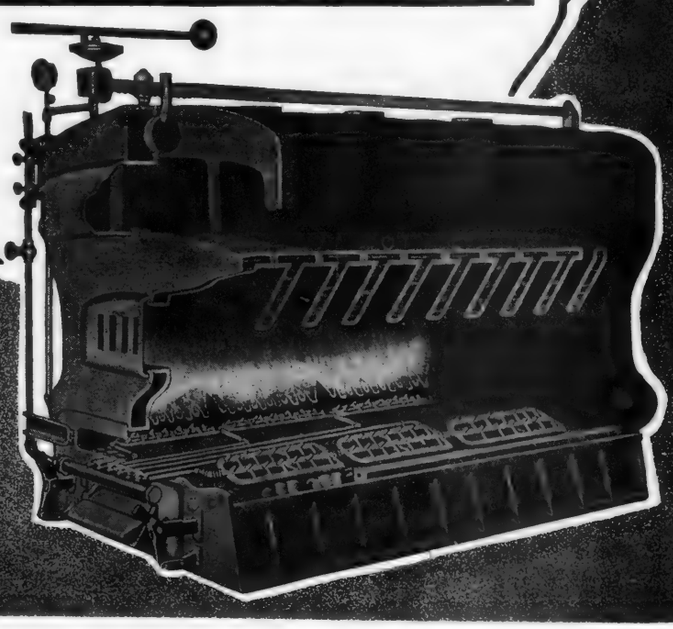
Not only does the Barber Burner put gas heat within easy reach of all, so far as installation cost is concerned, but it keeps the cost of operation at a low figure because it is so highly efficient.

Write us for complete information as to how you can increase your profits thru the sale and installation of Barber Burners and provide your customers with cleanliness and convenience of heating with gas.

Get our complete sales plan today.

If it's done with Heat—
You Can Do It Better with GAS.

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3102-04 Superior Avenue, Cleveland, Ohio



WHILE THEY ALL SAID "IT COULDN'T BE DONE" RICHMOND WAS DOING IT — — — AND SO WE PRESENT THE

"RICHMOND" MAGIC FLAME

ACCLAIMED BY ENGINEERS AS A BOILER WITH ALMOST SUPERNATURAL ENERGY

An Insulated Square Sectional Front Feed Boiler

FOR years we had been told that a Front Feed Boiler could not be made that would have the exclusive features of the famous Richmond "Model" Side Feed. But here is such a boiler and named the Richmond "Magic Flame," because of the miraculous way in which smoke is transformed into yellow flame.

A boiler with low water line; sections insulated with asbestos mill-board; large combustion space; maximum of direct fire surface, and free flue travel.

Smoke turned into Magic Flame

Even soft coal is burned smokelessly in this remarkable boiler. Combustion is so thorough that not only is dirty wasteful smoke eliminated but a greater percentage of heat power is secured from the fuel consumed.

Range of Sizes and Capacities

The "Magic Flame" will be made in three grate sizes (15″, 22″, and 36″ in width). Steam boilers will have a capacity of from 300 to 4,500 feet—Hot Water capacities will range from 500 to 7,500 feet. The small size will be ready for delivery about March 15th—other sizes as quickly as possible.

RICHMOND RADIATOR COMPANY
INCORPORATED

Executive Offices: 1480 Broadway, New York, N. Y.
Boiler Factory: Norwich, Conn.

BRANCH OFFICES:
Chicago, 668 Wrigley Building Boston, 460 Park Square Building
Phila., 2241 North American St. Cleveland, Cedar Ave. & Ashland Rd.
Harrisburg, Pa., 116 South Second Street

RICHMOND RADIATOR CO., INC.,
1480 Broadway, N. Y.

You may send me construction details and engineering data on the Richmond "Magic Flame" boiler.

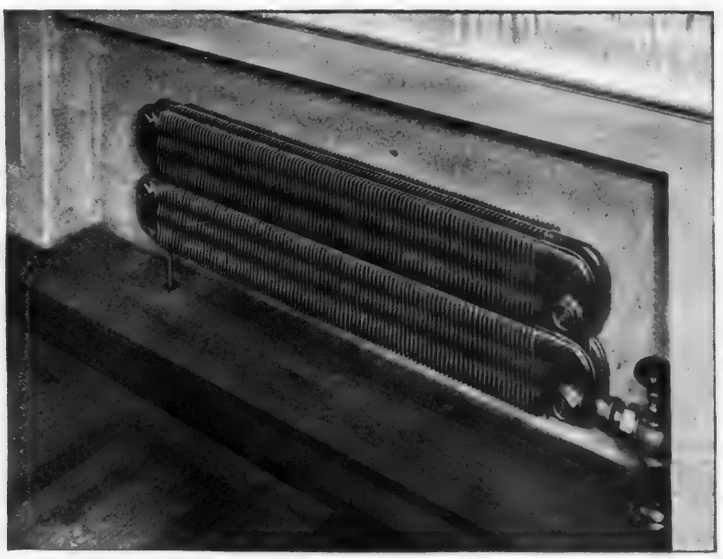
Name.....

Address.....

.....

H. V., 2-28.

Money in Your Pocket from ROBRAS 20-20 RADIATORS



THE light weight of Robras 20-20 radiators lowers their installation cost tremendously. Steamfitters find that they can set up from two to three times as many square feet of this radiation as they can of cast iron radiation.

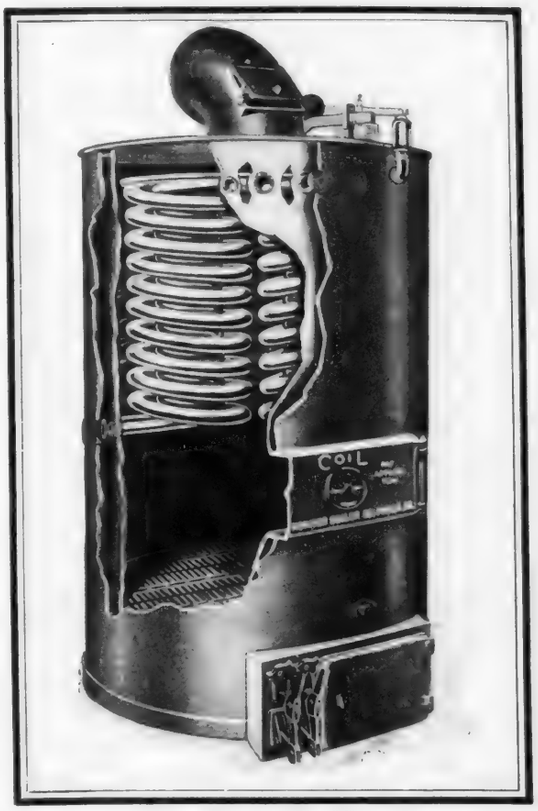
Then too, the amount of radiation that can be put in any specified space is limited only by the requirements of the room. Many new types of jobs should now come up for you. Chief among these are the replacing of old fashioned radiators that are in the way.

Robras 20-20 radiators are in the wall, out of sight and out of the way. They fit in a standard studding. Home owners are very pleased to find that you can offer them this means of getting rid of their radiator and decorating problems.

Send us your name and we will send you information and data sheets.

ROME BRASS RADIATOR
CORPORATION
1 East 42nd Street
New York City

OIL BURNING BOILER



COAL BURNING BOILER

COIL

STEEL HEATING BOILERS AND WATER HEATERS

When you consider that Coil Steel Heating Boilers have, in many cases, 50% more heating surface than the average boiler, you will readily appreciate how greater efficiency and greater economy are possible to users of Coil Boilers.

All heating surface, being in the combustion chamber, is reached directly by the radiant heat of the fire and is tremendously effective as compared to many other types of boiler construction.

The steel construction of Coil Boilers is virtually insurance against any repairs being necessary for years.

Steel will not crack under the strain of rapidly changing temperatures.

Write us for catalog containing full information.

MONITOR BOILER COMPANY

1505 Race Street :: :: PHILADELPHIA, PA.

To the Heating Contractors of America

Look into this fast-growing trend toward more effective, lower-cost water heating

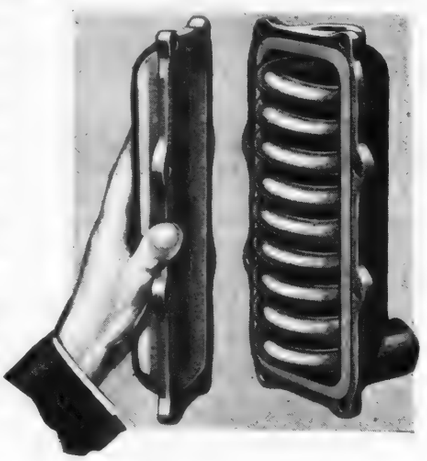
UP THROUGH the heating industry, each month more insistent, comes the voice of the building owner. Up through the architect, the heating engineer, the general contractor — every influence in the heating field— comes the cry, "Is the water-heating equipment as efficient, as low in operating cost, as modern engineering can make it?"

American Heating engineers and contractors long have led the world in heat - engineering accomplishments. Each new installation uncovers new problems, — American heating contractors have solved them well.

But what of the all-important water-heating equipment. Scores of contractors have heard the voice of the building owner. They have looked to the vital matter of modern water-heating equipment. They have investigated all types and makes. Many have finally standardized on compact, inexpensive FUEL-LESS Taco in connection with steam jobs.

Thus these wide-awake men have assured their customers a never-failing supply of clean hot water at an operating cost that's next to nothing. They have answered the insistent demand. They have assured their jobs, both large and small, against dissatisfaction.

If you are not already putting in Tacos you will be interested in the Taco story. Be sure to get the facts concerning the Taco Semi-Indirect, the water heater with three connections to the boiler. We will gladly give you all the facts and engineering data— show you how to add the finishing touch to well - installed jobs. A post card brings you the whole interesting story.



THERMAL APPLIANCE COMPANY
342 Madison Avenue New York City

Makers of

TACO

Automatic Fuel-less Water Heaters

Here is one of Dan's STILLSONS that's 37 years young

DAN STILLSON

Look at these teeth and that straight bar

(. . . Never mind the trick handle)

10-inch Walworth STILLSON wrench after 37 years' service.

W. V. Robbins, of Magna, Utah, sent us this husky veteran, a 10-inch Walworth that is still full of fight after 37 years of trouble-busting.

Mr. Robbins inherited it from his father's plumbing shop and used it in inspection work on locomotives for 20 years or more.

The handle seems to be a contrivance of his own which has grown old gracefully with a slight list to port. Notice the teeth, though, and the youthful straightness of the bar. That is the kind of lasting strength you can count on getting in any wrench of any size that carries Dan Stillson's own trademark —STILLSON—forged in a diamond on the top jaw.

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York.
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa., and Attalla, Ala.

Distributors in Principal Cities of the World
Walworth Co., Limited, 10 Cathcart St., Montreal, P. Q.
Walworth International Co., New York, Foreign Representative

Newark Plans Ahead!

WHEN a new building was being planned for the corner of Park Place and East Park Street in Newark, the architects, engineers and owners were not thinking in terms of five or ten years from now. Rather, they had in mind twenty, thirty, forty or even a greater number of years that this building would be there to serve and to serve well. And from the care and study put into its plan and the materials used in its erection, there is every reason to believe their expectation will be fully justified.

In view of assuring constant and uninterrupted service, careful consideration was given to the wear and tear of long years of use—while costs were rigidly studied—all pointing to the necessity of selecting materials that bore unmistakably the stamp of approved *quality*. And so considerable of the pipe tonnage in this building bears the name "NATIONAL"—the only pipe made by the Scale Free Process, butt-weld sizes ½ to 3-inch and Spellerized, sizes 4-inch and under.

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

NATIONAL

MILITARY PARK BUILDING
Newark, N. J.
Architects: Polhemus & Coffin
Engineers: Runyon & Carey
Plumbing and Heating
Contractors:
Jaehnig & Peoples

DUMPING OLD THEORIES OVERBOARD-OLD MAN CUSTOM IS HARD TO SQUELCH BUT WE ARE BECOMING ACCUSTOMED TO EXPOSING HIM. NOW WE ARE DISCARDING OLD METHODS OF RADIATOR RATINGS. OUR NEW WAY IS SCIENTIFICALLY CORRECT. LOWER FIRST COSTS UNIFORM HEAT BETTER RESULTS

Richmond Adopts Code Ratings for Radiators

Affects Every Heating Engineer and Contractor

RICHMOND announces it will henceforth publish its radiator ratings in B.t.u. and equivalent direct radiation, in understandable words and figures, as determined by condensation tests conducted according to the Code of the American Society of Heating and Ventilating Engineers for testing Direct Radiators.

The design, construction and efficiency of radiators have improved year after year, yet no change of any consequence has followed in rating of radiators, as is proved by the present very apparent inconsistency in ratings.

Low, narrow radiators have greater efficiency than high wide ones. This is a well-known scientific fact. It is incorrect to rate radiators by square feet of actual heating surface whether radiator is high or low, wide or narrow, with little or much air space between sections. One example will suffice—Various 5 tube radiators, 34 to 38 inches in height, 8 to 9 inches in width, varying radically in air space between sections and in actual heating surface, are each rated at 5 sq. ft. per section.

By its new policy, the Richmond Radiator Company has at one stroke insured scientific results in figuring radiation for buildings—insured uniformity of heating and a saving in first cost and fuel consumption, and enables contractors to secure contracts heretofore lost through lack of information of the actual performance of radiators.

Our Detailed Report is startling—indeed

To those who desire an extra profit of 10% on their radiator purchases or who wish to be in a position to estimate their radiation 10% less, we have a message which we believe will bring commendation and approval.

We have just completed exacting and accurate laboratory tests of all Richmond Tube Radiators based on 1 lb. steam pressure and radiators standing in still air, 70 degrees at breathing line (5 feet above floor), according to Code of American Society of Heating & Ventilating Engineers for testing Direct Radiators.

It isn't possible to give in this space the full report including examples of just what the heating contractor will gain by new scientific ratings but it is startling, we assure you. Send for a copy now.

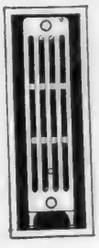
RICHMOND RADIATOR COMPANY

Incorporated

Executive Offices: 1480 Broadway, New York, N. Y.
Radiator Factory, Uniontown, Pa.

Branch Offices:

Chicago.....563 Wrigley Building Boston....460 Park Square Building
Philadelphia.2241 N. American St. Cleveland.Cedar Ave. and Ashland Rd.
Harrisburg, Pa....116 S. Second Street



Richmond Radiator Co., Inc.
1480 Broadway, New York

You may send me data on Richmond Radiators according to Official Codes.

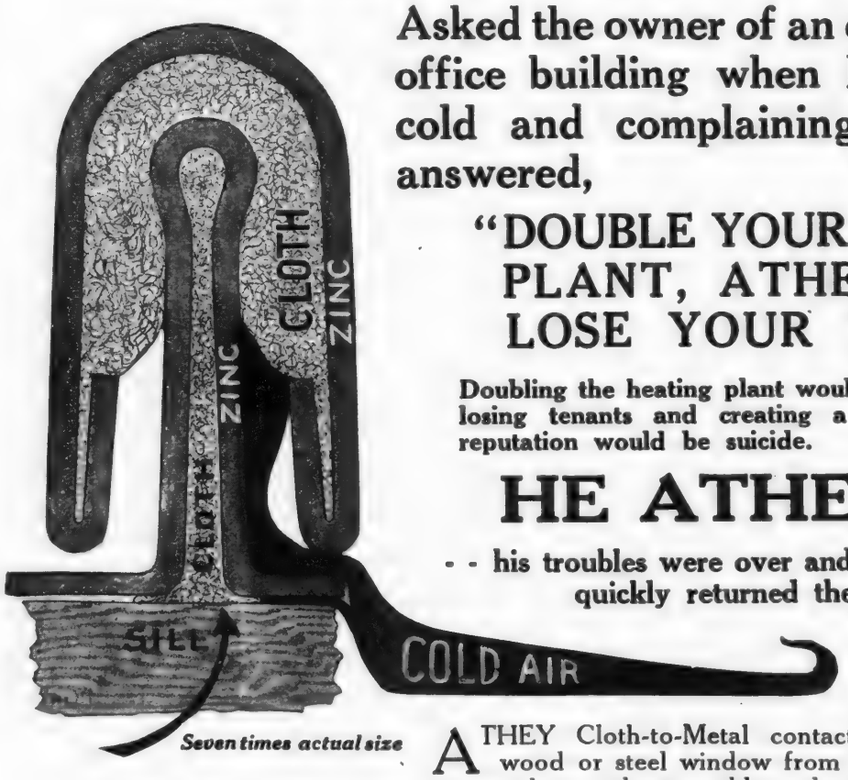
Name .....

Address .....

.....

H.V.2-28

"What shall I do?"



Seven times actual size

Asked the owner of an enormous modern office building when his tenants were cold and complaining. His architect answered,

"DOUBLE YOUR HEATING PLANT, ATHEYIZE OR LOSE YOUR TENANTS"

Doubling the heating plant would be very expensive,—losing tenants and creating a "COLD BUILDING" reputation would be suicide.

HE ATHEYIZED

- - his troubles were over and the saving in fuel quickly returned the investment.

This is the little article that saved the tenants and fuel enough to quickly pay for itself.

ATHEY Cloth-to-Metal contact weatherstrips change any wood or steel window from a rattling, loose, drafty sash to one that works smoothly and quietly and is absolutely draft-proof when closed.

Why force the Heating Plant by trying to heat all outdoors when a simple ATHEY installation quickly pays for itself with the saving in fuel? **(A Chicago office building saved 572 tons of coal in 5 months).**

A prominent firm of New York architects made exhaustive tests of various well-known mechanical devices for reducing air leakage through windows. They found that ATHEY cloth-lined metal weatherstrips were eleven times superior in reducing leakage over non-weatherstripped windows and more than four times as efficient as the best of other installations.

Send for the New Athey Book

It contains valuable information for any building owner or manager, architect or engineer desiring to save fuel, prevent drafts and increase comfort.

Heating Specifications can call for less radiation when buildings are ATHEYIZED.

ATHEY COMPANY
6027 W. 65th St. CHICAGO

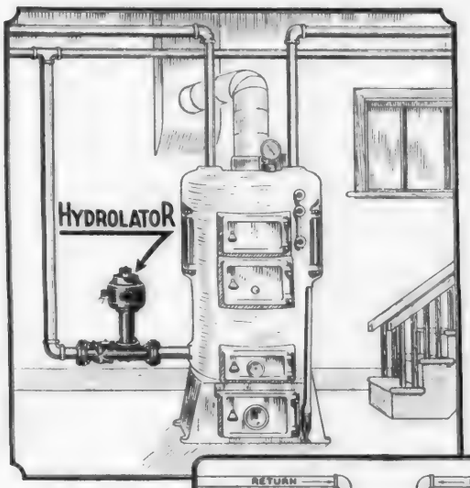
Detroit: W. O. LeSage & Co., 410 Donovan Bldg.
Cresswell-Mc ntosh, Reg'd, 420 Seigneurs St. Montreal, Quebec.
Branches in Principal Cities.

Athey

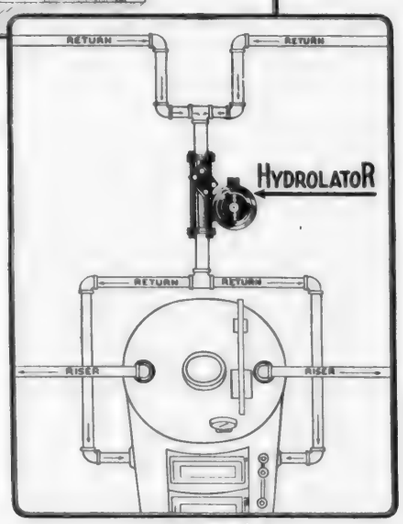
Cloth-Lined
METAL WEATHERSTRIPS
and Perennial Window Shades

A Few Prominent Athey Equipped Hotel Buildings with Low Coal Bills and Comfortable Guests

ANNOUNCING The HYDROLATOR



HYDROLATOR *installation showing only one return to boiler.*



HYDROLATOR *installation showing two returns to boiler.*

The NEW Device Which Completely Modernizes Hot Water Heating Systems

Equipped with a HYDROLATOR, the hot water heating system is beyond all doubt the most modern heating system that you can give your customers. The HYDROLATOR makes possible quicker, cheaper and more uniform heat.

Big Fuel Savings

The HYDROLATOR has been in use only a very short while, yet coal savings of over 30% have already been recorded in several instances.

More Heat to Radiators

The HYDROLATOR circulates water through the system several times faster than it flows by natural action, thus more heat reaches the radiators. And every radiator gets an equal amount of heat, regardless of whether it is above, below or on a level with the boiler.

Noiseless

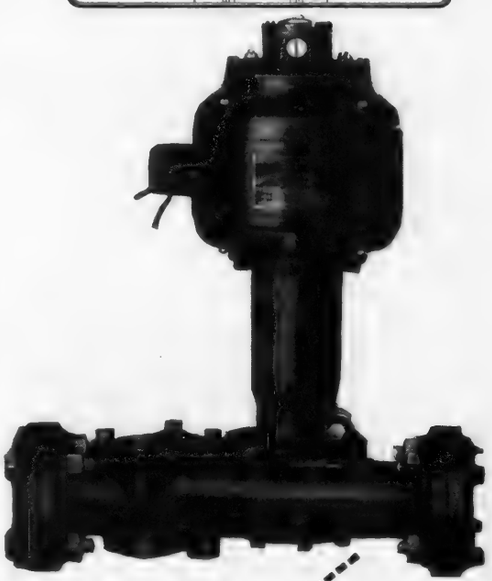
The HYDROLATOR is practically noiseless—cannot be heard more than a few feet away.

Simple, Sturdy Design

In every detail the HYDROLATOR is a strong, heavily-built device capable of years of service.

Low Cost

The HYDROLATOR is reasonably priced—and its fuel savings soon wipe out the first cost. In new buildings it makes possible the use of smaller pipes, thus paying for itself before used.



Clip and mail the coupon for prices, discounts and Bulletin 128-H

Janette Manufacturing Company
556-558 West Monroe Street
Chicago

Singer Bldg.,
149 Broadway
NEW YORK

Real Estate
Trust Bldg.,
PHILADELPHIA

THE JANETTE MANUFACTURING CO.,
556-58 W. Monroe St., Chicago, Ill.
Gentlemen: I want full information on the HYDROLATOR. Please send me prices, discounts and Bulletin 128-H.

Name .....
Address .....
City ..... State .....

And in Los Angeles' new City Hall

J. C. Austin, A. C. Martin, John Parkinson, *Associate Architects*
Lohman Bros., *Heating Contractors*
English & Lauer, *Oil Burner Specialists*

JOHNSON OIL BURNERS

Product of 23 Years' Experience . . . .

JOHNSON ROTARY OIL BURNERS, with full automatic control, embody the engineering refinements of 23 years' exclusive oil burner development... precision methods of manufacture...clock-like fineness...uniform dependability.

The most compact oil burner made... hence simple, efficient, durable... *Accessible*...swings out for instant inspection... *Safe*... fully automatic... five independent control devices... Industrial and domestic models, a size for every type of building... World-wide distribution.

Gold Medal Award at Sesquicentennial Exposition, 1926

THE Johnson Rotary Automatic is approved by Underwriters' Laboratories & New York Board of Standards and Appeals.

MEMBER OIL HEATING INSTITUTE OIL HEAT

JOHNSON "JUNIOR" *for small homes*

THE well-known Johnson "Junior"... for homes of from five to twelve rooms... is fully automatic. A remarkably compact burner, with all the Johnson ruggedness and capable heating qualities. *Write for new descriptive bulletin.*

S. T. JOHNSON CO.
OIL BURNERS
TRADE MARK REGISTERED

Main Office and Factory, 949 Arlington Avenue, Oakland, Calif.
Factory Branch Offices: San Francisco, Sacramento, Philadelphia
Distributors and Dealers throughout the United States and in Foreign Countries

628

SELL *the* Sundstrand for 70° Effortless Warmth

Selling Oil Burners is one thing but selling Sundstrand Effortless, Oil Heat is quite another.

The Sundstrand, itself, is everything an Oil Burner should be. The Merchandising Plan has been proven right beyond the question of a doubt in cities of every size.

The Sundstrand franchise is not merely the right to sell an Oil Burner so dependable that its makers guarantee it for 10 years,—it is an opportunity to build a permanent business because the Sundstrand proposition has every element necessary for success developed to a high degree.

The Sundstrand franchise is still open in the following principal and many other smaller cities:

Omaha, Neb.
Davenport, Ia.
Indianapolis, Ind.
Louisville, Ky.
Toledo, Ohio
Harrisburg, Pa.
Albany, N. Y.
Schenectady, N. Y.
Providence, R. I.
Portland, Me.
Denver, Colo.

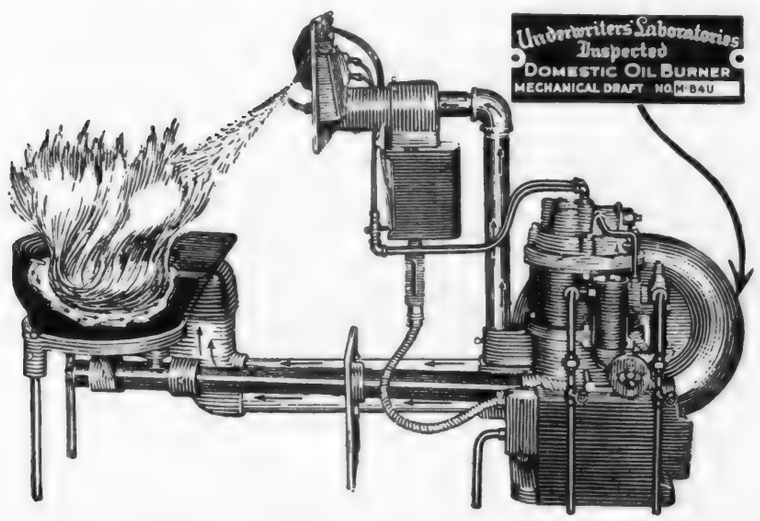
If you believe in today and have a vision of tomorrow, take advantage of this opportunity. Your territory may still be open.

WRITE OR WIRE

for a selling plan so complete and workable that Dealers everywhere are building a permanent, profitable business.

SUNDSTRAND ENGINEERING CO., Dept. H-2, Rockford, Ill., U. S. A.

Manufacturers of Precision Machinery Since 1905



REASONS WHY
Sundstrand Owners Boost

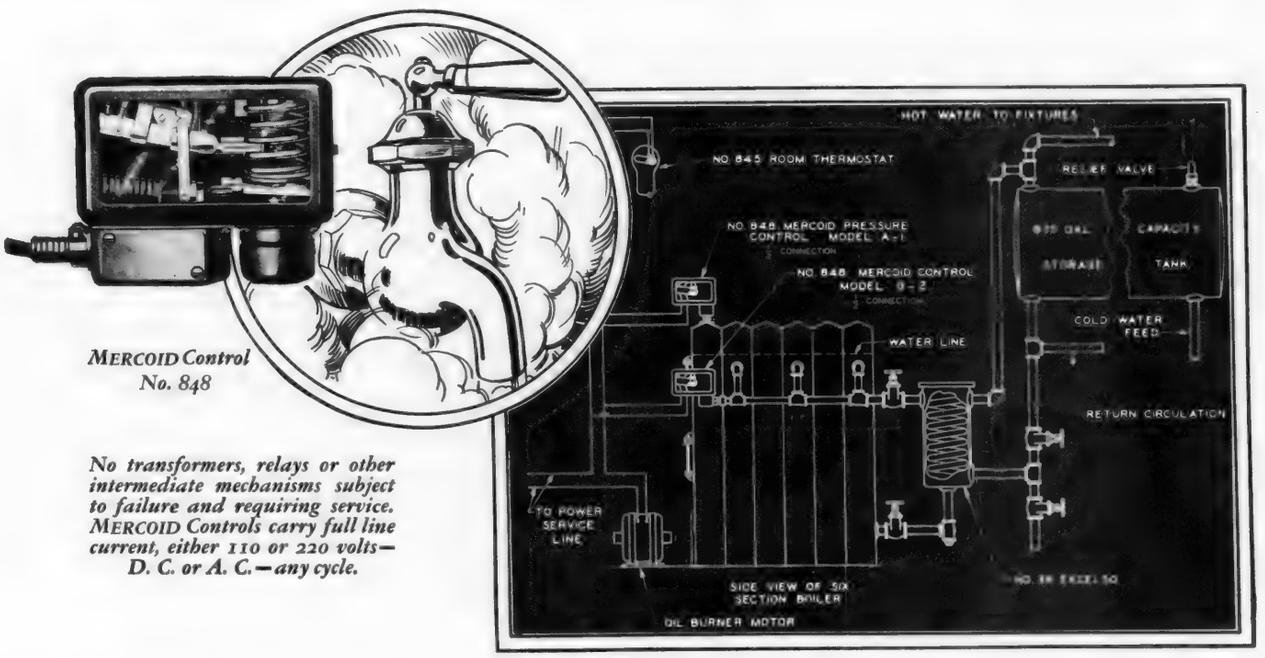
Absolute Dependability
Payment Financing Where Desired
Full Automatic Operation
Full Automatic Safety Control
Constant Electric Ignition
Quiet As A Mouse
No Radio Interference
Adjustments for Different Grades of Oil
Economical
Sell the Sundstrand

MERCOID

Creates Year-Round Service for

OIL BURNERS

And a Source of Additional Income FOR YOU



MERCOID Control No. 848

No transformers, relays or other intermediate mechanisms subject to failure and requiring service. MERCOID Controls carry full line current, either 110 or 220 volts—D. C. or A. C.—any cycle.

THE above diagram shows how MERCOID allows an oil burner to heat water during the summer months on a steam boiler. An indirect type of water heater like EXCELSO is installed below the water line in the regular manner. No. 848 MERCOID Temperature Control is attached to the boiler and is set to maintain a temperature—*in the boiler*—of between 160° and 180°, independent of whether or not the thermostat is calling for heat. This water temperature in the boiler is amply sufficient to provide, through the external heater, the proper tank temperature.

The wiring diagram shows how the connection should be made so that, during the summer or on warm winter days, no steam is supplied to the radiation. This is an ideal hook-up for hotels, apartments, store buildings, office buildings, etc. It eliminates the necessity for a separate water heater—either winter or summer; and, obviously, it offers you an additional opportunity to expand your business.

Should you desire any further information or data on the subject communicate with us and your inquiry will be given prompt attention.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION DEPT. H.

816-820 South Michigan Avenue Chicago, Illinois

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

ABC's new method of selling oil burners assures good profits

YOU can earn from $3,000 to $10,000 a year as an ABC agent.

You do not have to invest any money, burden yourself with a big contract, or even have a display room.

To make a fine income all you need is ambition.

Tell us about yourself. Have you had any selling experience? What do you know about oil burners? How long have you lived in your city? Your letter will be considered confidential.

AUTOMATIC BURNER CORPORATION

312 NORTH MAY STREET

CHICAGO

THE names of acknowledged leaders in the manufacture of oil burners are on the list of Webster Ignition Transformer users ... Under severe tests in actual use, this dependable oil burner ignition unit has proved itself worthy of being designated as standard equipment on many reliable oil burners ... You, the dealer, realizing the powerful sales help to be derived from a list of satisfactory installations in your community will be wise to insist that Webster be the ignition servant on the oil burner you sell ... Satisfied oil burner users are then assured.

A
Good Oil Burner
+
Webster
=
Dependable Ignition

WEBSTER ELECTRIC COMPANY
RACINE, WISCONSIN, U. S. A.
Specialists in Oil Burner Ignition

Webster Ignition Transformer

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, 110 or 220 volts, 60 cycle, 110 or 220 volts, 25 cycle.

10 Brief Reasons Why
Hardinge Fuel Oil Heat
Sells

Which Is Why You Should Sell
HARDINGE

1 Because thousands of satisfied users have found it dependable season-after-season, and don't hesitate to tell their neighbors about it.

2 Because it is the only oil burner with a *Ten-Year Factory Guarantee*—a real bond of confidence.

3 Because, built by a financially strong company with 37-years' experience in manufacturing precision-built machines and forcefully advertised, buyers' investment protection is assured.

4 Because it is listed as standard by Underwriters Laboratories and approved by Board of Standards and Appeals of New York.

5 Because it is quiet—automatic—durable—easily understood—economical, completely burning cheaper grades of oil efficiently.

6 Because all bearings are submerged in lubricating oil, and require a minimum of attention.

7 Because there are twelve different sizes and combinations—all parts standard and interchangeable—providing individual treatment to fit the needs of any heating plant, from bungalow to skyscraper.

8 Because scientific distribution of flame over grate area of boiler and numerous exclusive, patented features assure economy and dependability unobtainable elsewhere.

9 Because it is endorsed and specified regularly by leading architects and heating engineers for installation in the finest buildings in America.

10 Because it is sold only by dealers equipped to render prompt day and night service—a service demanded by Hardinge policy, seldom found necessary, but nevertheless a reassurance to the layman.

We shall be glad to discuss the Hardinge Franchise with you if you are a substantial dealer. Call on or write

HARDINGE BROTHERS, Inc.

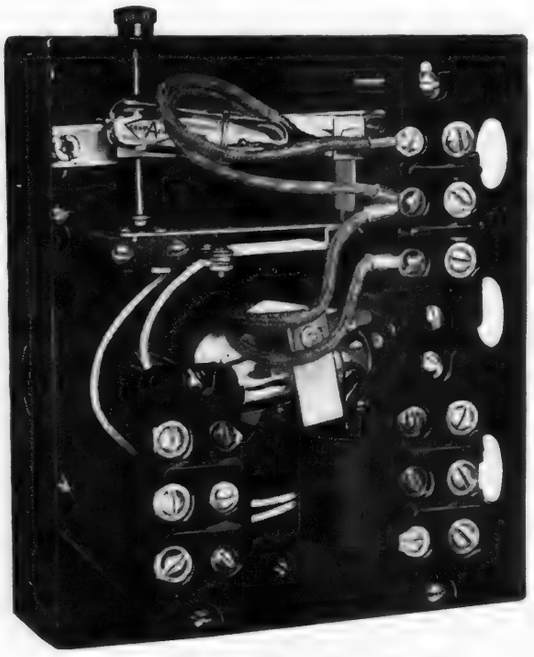
Manufacturers of Precision-Built Machines for 37 Years

Factory and General Offices:
4149 Ravenswood Avenue, Chicago

Factory Branches:
Chicago, Michigan Ave. at Ohio St.
Boston, 839 Beacon Street

you can safely have confidence in

HARDINGE
FUEL OIL HEAT



The New Lockswitch

USE THE CON-TAC-TOR No. 77 LOCKSWITCH on your 1928 MODEL OIL BURNERS

In its first year, the No. 77 Lockswitch established itself as a leader in the field of Oil Burner Safety Controls. Now, *The New Lockswitch,* retaining all of the merits of its predecessor and including a host of improvements is presented. The Lockswitch has been revised throughout to insure even greater safety, dependability and convenience of installation and at the same time provide a more compact and attractive unit. As before, the Lockswitch is offered in combination with other accessories necessary to Oil Burner operation in groups effecting material savings in control costs.

The major improvement included in the new construction makes the operation entirely independent of the motor current. Other notable features and improvements are listed below. *So vital* are these improvements that we want every Oil Burner Manufacturer to have an opportunity of testing this control circuit in his own laboratory. Full information, prices and test samples await those desiring to obtain the best in Safety Controls. The attached coupon will bring them to you. Mail it today.

ABSOLUTE CON-TAC-TOR CORPORATION
Elkhart, Indiana.

Please send me:

☐ Full information and prices.
☐ Test sample of the No. 77.

We are ☐Dealers ☐Dist'rs ☐Mf'rs

of the .....Burner.

Signed .....

.....

HV 228

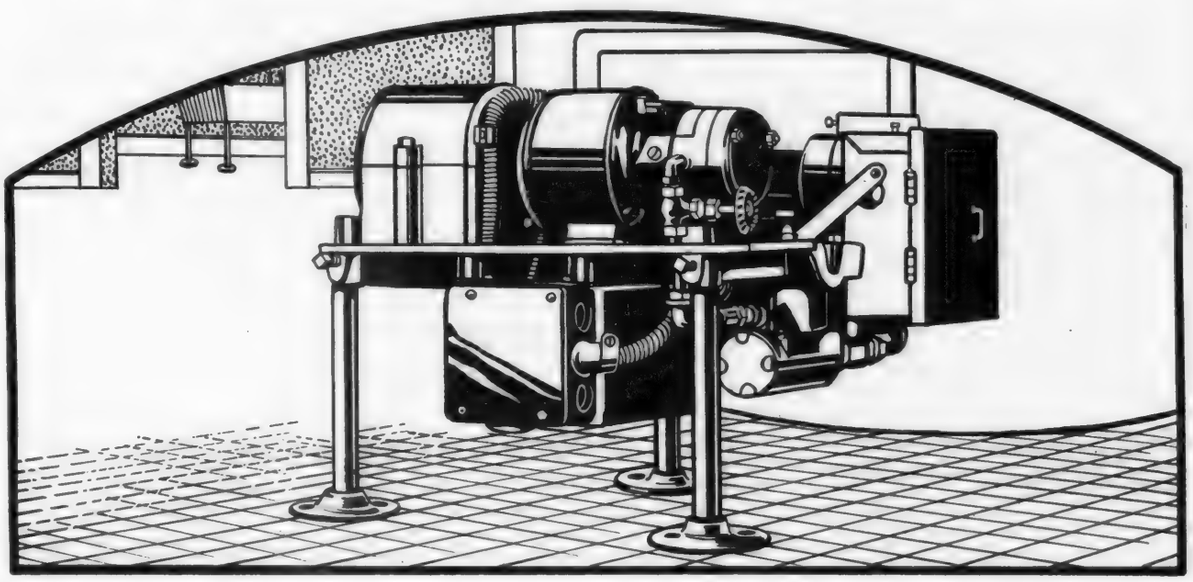
Features of the New Lockswitch

Now independent of motor current.
A new, compact, attractive case.
Easier wiring—colored terminals, convenient knockouts.
New simple adjustment for safety timing.
Greater factors of safety throughout.
New type Con-Tac-Tors.
Thermal Safety and Stack timed ignition.
Complete Recycling.
Listed as Standard by Underwriters' Laboratories.

ABSOLUTE CON-TAC-TOR CORPORATION

ELKHART, INDIANA

Ideal Oil Heat for the *Warm Air* Furnace



LISTED AS STANDARD BY THE UNDERWRITERS LABORATORIES

There has never been such an ideal piece of oil heating mechanism for warm-air furnaces as the Nu-Way H-10. It is small in size—for the 5 to 10 room house—and is priced low. It is quiet, operates at low pressure and burns the cheaper grades of oil. The combustion is substantially perfect.

The H-10 is but one of the six sizes of

AUTOMATIC OIL BURNER

Nu-way

FOR HOME HEATING

There is a Nu-Way size for anything from a hot water heater to the largest hotels or apartment buildings.

In selling oil heat sell a full line so that you can supply the size exactly suited for the job.,

Send for our catalog, prices and terms.

THE NU-WAY CORPORATION

Rock Island, Illinois

COMING!

A NEW LEADER IN THE OIL HEATING INDUSTRY

THE Petroleum Heat & Power Company, during twenty-five years in the oil heating industry, has developed a complete line of oil burners of unusual range. Our smallest burner operating quietly on 24° Fuel Oil has a range of 200 ft. of steam radiation to 1000 ft. The largest size using 14° Bunker C Fuel oil will handle boilers of 1000 horse power. The line, which includes all intermediate sizes, is now available for widespread distribution.

Public announcement to be made shortly will prove of interest to distributors who realize what can be done with a complete line of *fully engineered* oil burners backed up with a substantial sales and advertising program.

PETRO

REG. U.S. PAT. OFF

DOMESTIC AND INDUSTRIAL OIL BURNERS

PETROLEUM HEAT & POWER COMPANY

Makers of Oil Burners Since 1903

511 FIFTH AVENUE NEW YORK, N. Y.

Reading time of this 4-page announcement is 4 minutes. It is of vital importance to all who have a heating or cooling problem.

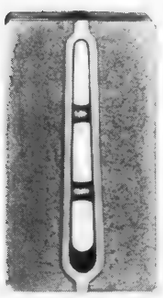
Announcing

An Epoch Making Achievement

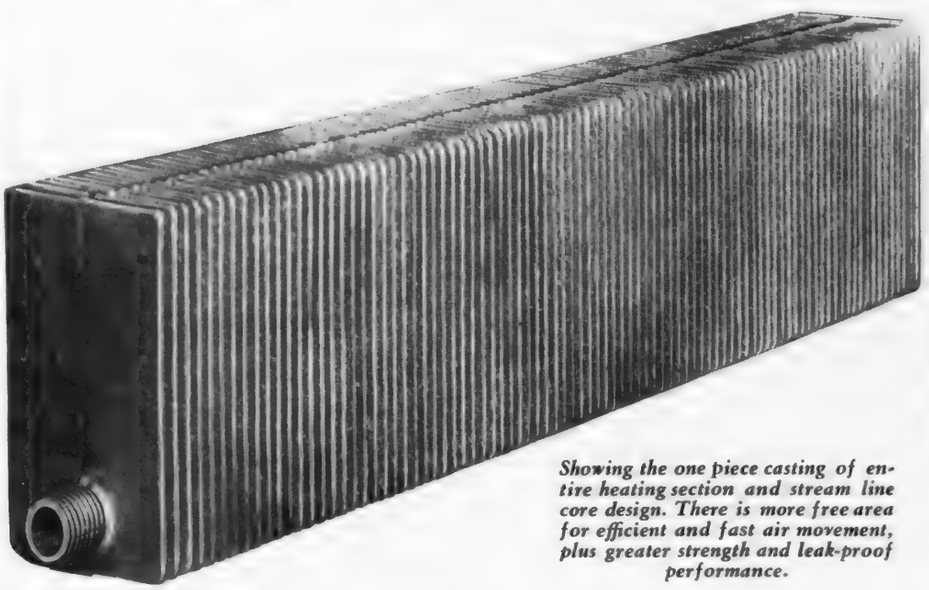
The THERMAL UNIT

The Integrally Cast Aluminum Extended Surface Heating Element

Leak Proof—Non-Corrosive



Cross section showing internal stays.



Showing the one piece casting of entire heating section and stream line core design. There is more free area for efficient and fast air movement, plus greater strength and leak-proof performance.

Cross section of core showing free steam or water way.

Built for pressure from 0 to 250 lbs.

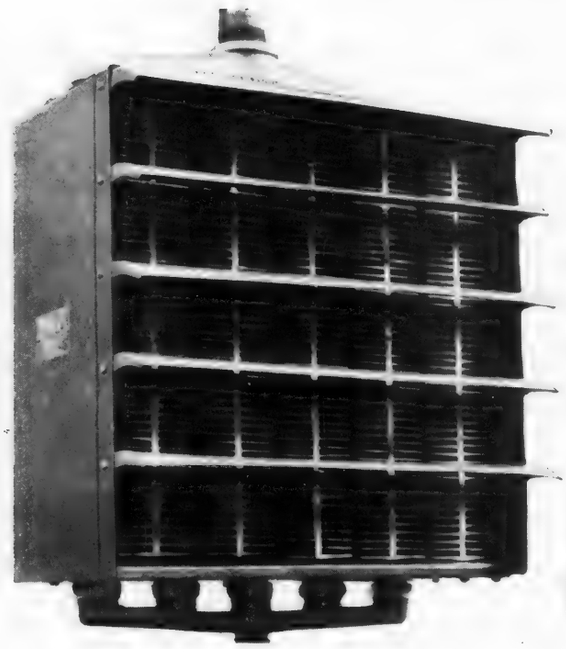
THE Thermal Unit marks a great advance in the art of heating and cooling. It has the compactness and capacity of the assembled copper and aluminum type radiators, together with a strength and durability unattainable in the most massive prime surface cast iron radiators or pipe coils.

The Thermal Unit is used exclusively in all heating and cooling equipment manufactured by this company, and is responsible for establishing standards of performance and durability hitherto unsurpassed. See next pages for Thermal Unit Products.

THERMAL UNIT
INTEGRAL SECTION
MECHANICAL

THERMAL UNIT HEATERS

The Practical Fulfillment of UNIT HEATER Principles



THE Thermal Unit Heaters offer **ALL** that any Unit Heater has offered, plus an entirely new and revolutionary feature. This feature is The Thermal Unit—the integrally cast aluminum heating element —that cannot be damaged by freezing in service, that is leak-proof—non-corrosive and has the strength of Gibraltar.

It is inconceivable that any test in the service for which it is designed could affect the operation of this heating element.

We believe engineers will recognize that in The Thermal Unit Heater their hopes for a trouble proof Unit Heater have been realized.

Developed and Tested by Actual Use

After the Thermal Unit Heater had been designed, constructed and tested according to the most approved laboratory method, it was subjected to the severest tests in actual practical installations. It is now serving unfailingly in some of the greatest plants of this country under the severest conditions it is possible to find.

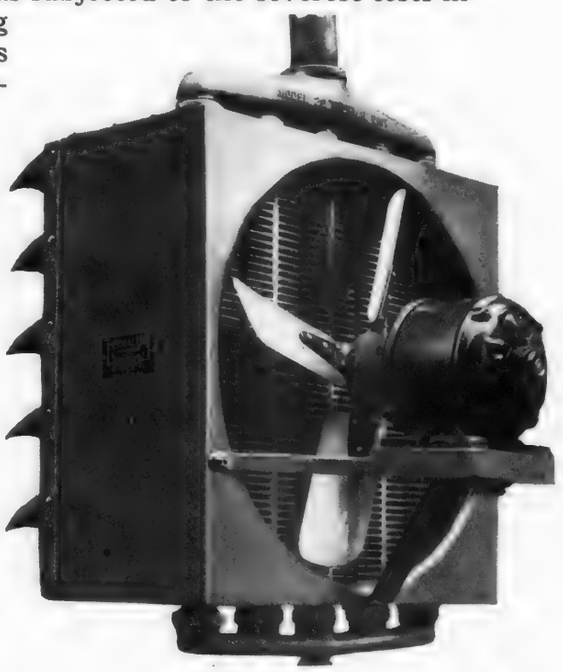
Unsurpassed in Practical Efficiency

Under actual conditions of service the Thermal Unit Heater is not only demonstrating the remarkable BTU efficiency of the heating element, but the Thermal Unit Heater is proving its practical efficiency in delivering heat where it is wanted with the utmost efficiency.

The design of integral fin and core casting so increases the rate of heat transfer, that larger volumes of air may be warmed in shorter periods of time.

Not only the heating element, but the fan and deflectors have been designed in accordance with the most recent discoveries of air motion and velocity. The effect of the airplane wing upon velocity has been studied and applied with amazing results.

It is for these reasons that the Thermal Unit Heater delivers heated air for greater distances than is usually expected from a Unit Heater.

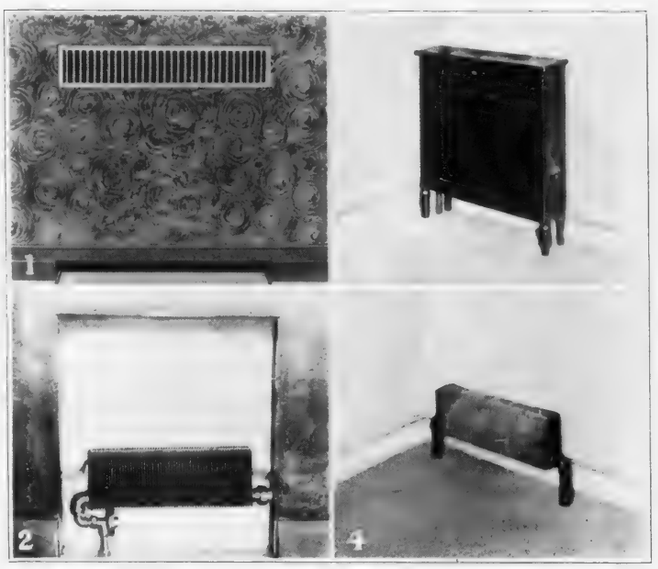


The Motor and Fan Assembly of the Thermal Unit Heater is strong and durable. It is designed for continuous operation over long periods of time with minimum attention for lubrication and maintenance.

THERMAL UNIT
INTEGRAL SECTION
MECHANICAL
Heater

CONCEALED AND CABINET HEATING
with Thermal Units

THE remarkable efficiency of Thermal Units in gravity heating, whether concealed in the wall or in a cabinet, is due to the fact that the streamline design of the core, and airplane type of the extended fins offer little resistance to air flow. The flue effect of the cabinet or casing in the wall, multiplies the convection power of the heating element. The cooler air enters the inlet below, passes up through the heating element, is heated and issues from the grill outlet above. This induces a continuous air motion in the room and has a tendency to equalize floor and ceiling temperatures.



No. 1 shows a typical wall installation behind removable panel. Owing to indestructibility of Unit it is often installed without removable panel. No. 2 view with panel removed. No. 3 illustrates Thermal Cabinet unit. No. 4 Thermal Unit with cabinet removed.

Advantages of Thermal Unit Sections

1—Integral Casting of fin and core saves penetration and conduction losses.

2—Streamline design of core and extended surfaces permits natural quick movement of air through heating element without cross eddies or friction losses.

3—Design permits a larger volume of air to be handled at higher velocity, with minimum lower cost.

4—Greater range of heat distribution.

5—Greater strength in heating sections.

6—Non-corrosive material.

7—No joints of any kind in the heating elements inside or out—absolute freedom from leaks.

8—Operates efficiently on all steam pressures from atmospheric vapor to 250 pounds.

9—Cannot be damaged by freezing.

10—Unobstructed circulation of steam in smooth streamline core—no air pockets.

11—Durable construction that will last for years without attention or repairs.

12—May be used with perfect safety and efficiency and without change,in hot water, vapor and steam heating systems, as well as with cold water, brine or refrigerants in cooling systems.

Indestructibility the Prime Requisite for Concealed Heating

Obviously an heating element must be small if it is to be concealed in the wall but most important of all it must be so designed that it will require no service. The Thermal Unit will give trouble proof service while the building stands.

It is so compact that we are able to furnish concealed Thermal Units that will fit in any 4-inch standard wall.

Fan Application for Concealed Thermal Units

In Assembly rooms—large dining rooms and often even in private homes, it is desirable to increase heat capacity without increasing the size of the heating unit.

For such uses we have designed a special Unit for fan application.

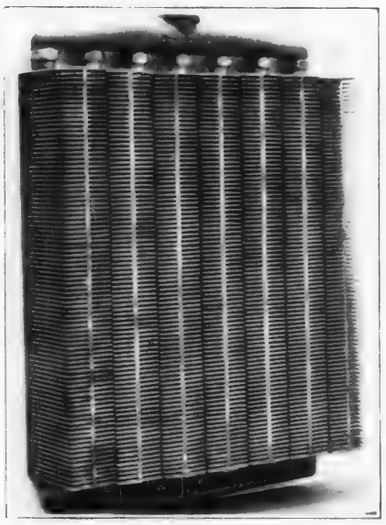
Ventilation and Heating

Where a room requires ventilation as well as heat, the installation may be made with an opening to outdoor air. This opening is fitted with a damper. This unit may be operated by taking outdoor air and heating through the Unit, or, by closing the damper, room air may be recirculated.

The application of fans to concealed or cabinet heaters will always multiply their capacity. Fans may be placed below, above, or behind the radiator, depending upon the architectural requirements.

THERMAL UNIT
INTEGRAL SECTION
MECHANICAL
Concealed and Cabinet Heating

Thermal Unit Section Assemblies for Blast Heating *and* Cooling



BECAUSE of the remarkable heating efficiency of these heating units, and their compactness, they are ideal equipment for the engineer who is designing any heating or cooling layout.

The sections may be placed in single, double or triple banks of any size to fit any space requirement.

Our Engineering Staff is at Your Service

If you have any air conditioning problem, such as heating, drying, cooling, humidifying or deodorizing, or special condensing requirements, we invite you to consult our engineers. We maintain a competent staff which has had experience in solving thousands of special problems.

Our engineers will gladly study your problem and submit recommendations and cost estimates.

Just send a blue print of your establishment—a description of your present equipment and a statement of the results you desire.

No matter what your problem is, we urge you to at least acquaint yourself with the very definite economies and advantages we offer, before making your decision.

Thermal Units Company

a Division of

The MECHANICAL MANUFACTURING CO.

Pershing Road and Loomis Street
CHICAGO

Eastern Office: **30 Church Street, New York City**
New England Distributors: **BRAMAN, DOW & CO., 239 Causeway Street, Boston, Mass.**

THERMAL UNIT
INTEGRAL SECTION
MECHANICAL

31 Miles of Improved Asbestocel on One Job!

In the world's largest hotel—The Stevens, at Chicago —the J.-M. Asbestocel used measures 165,000 feet.

In the new Stevens Hotel at Chicago, there are 31 miles of Johns-Manville Improved Asbestocel. While it was true that this is an exceptionally large contract, it suggests some of the possibilities which plumbing contractors are using to increase their profits.

Not only is there a profit possibility of real importance in residence work in your neighborhood, but schools, office buildings, apartment houses and similar structures all have to have pipe insulation, for their heating plants.

Because of its structure Johns-Manville Improved Asbestocel is at least 15% more efficient than ordinary low pressure pipe covering. Engineers, architects, property owners and public officials are being sold Asbestocel by its national advertising of its merits.

Everyone will accept Johns-Manville Asbestocel and be pleased with it. It is the only nationally advertised, nationally distributed low pressure insulation. You might just as well use the best and have the advantage of its national reputation.

JOHNS-MANVILLE

ROOFINGS and INSULATIONS
OF FIREPROOF ASBESTOS

NEW YORK · CHICAGO · CLEVELAND · SAN FRANCISCO

Showing a small section of high pressure steam line running from central heating plant to a hospital, Rochester, N. Y. According to tests made by engineers for the heating company, the line loss for this section, and also the East Avenue low pressure line (about 4000 feet long and also Ric-wiL) shows the lowest in the complete system, and they are using different kinds of construction. Details upon request.

The Heat is Delivered

FEED your heat into underground lines insulated with Ric-wiL Conduit and it arrives where you send it—practically always more than 90%. Ric-wiL engineers have brought insulation to new high levels of effectiveness and produced a conduit that gives it perfect protection.

With the Loc-liP side joint and Ric-wiL base drain outside moisture simply cannot enter. While Dry-paC, the remarkable waterproof insulation makes damage from line leaks impossible. Besides, installation of Ric-wiL is so easy, quick and economical that the installed cost is often less than ordinary unsafe conduit.

We contract for complete installations of our conduit system or furnish expert supervision.

THE RIC-WIL COMPANY

Originators of Waterproof Conduit Filler

1567 Union Trust Bldg. Offices in principal cities. **Cleveland, Ohio**

This Folder . . *In Your* Files

is something for which you will have frequent use. It is a General Insulation Folder — contains a fund of helpful material compiled and prepared by insulation engineers— and will be of great service in figuring fuel savings and other problems relating to scientific insulation. Convenient in size and arrangement— easily accessible when filed.

INSULITE

the Wood-Fiber Insulating Board

THE INSULITE COMPANY
Builders Exchange
MINNEAPOLIS
MINN.

Fill out the coupon or write us a letter or card and a copy of the folder will be sent immediately — without charge.

Please send a copy of your General Insulation Folder.

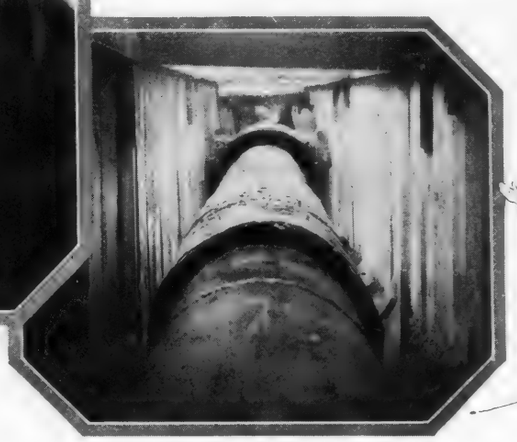
Name.....

Address.....

City..... State.....

BANROC

Easy to apply. Simply slip it around the pipe, wire it on, and it's there to stay. If repairs to the pipe are necessary it can be removed and replaced without injury to the material or its efficiency.



Mr. B.T.U. Says:—

Insulate "*Forever*" with Banroc No. 45 Underground Pipe Insulation

"Insulate your underground steam lines with Banroc No. 45 Underground Pipe Insulation and forget them," says Mr. B. T. U., Grand Ruler of the Realm of Heat.

"Forever is a long time, but don't forget this, there is nothing about Banroc to decay or disintegrate. Thirty years of service proves its permanence, for some of the first ever made, over thirty years ago, is still giving perfect satisfaction.

"And there's no question about its efficiency. It has led the list at the U. S. Bureau of Standards so long, that it is doubtful that there will ever be anything to equal it."

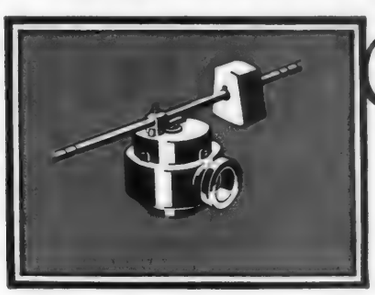
Banroc Insulation is made of the famous Banroc Wool, which is made of rock, melted and blown into tiny fibres that entrap about 92% dead air cells. It is fireproof, will insulate efficiently at all temperatures up to 1200° F.

Send for our new booklet, which fully describes the line of Banroc Products.

Banner Rock Products Co.
ALEXANDRIA, INDIANA
Originators of Rock Wool Products

UNDERGROUND PIPE INSULATION

All the Joys of home depend on~



A Thermostatic Temperature Damper Regulator that is complete in itself and very easy to install. Requires little attention to maintain uniform temperatures.

Your customers will tell their friends about their wonderful heating plant if you install Hot Water Heat Thrush Equipped.

A Good Heating Plant... HOT WATER HEATING THRUSH EQUIPPED

Your Customers want Comfort.

THRUSH SYSTEM makes a closed and automatically regulated job from any ordinary hot water heating plant. It may be adapted to any kind of boiler and can easily be installed on old or new plants. It will positively make any hot water heating job work better, giving increased heat transmission, quicker circulation and a saving in fuel of 20% to 40% annually. It lengthens firing periods and assures mild uniformly maintained temperatures in your customers' homes. It's the kind of product you like to sell—and selling it builds friends for you.

Use the coupon now!

THRUSH SYSTEM
OF HOT WATER HEATING

Nationally Advertised

H. A. THRUSH & CO.

PERU, INDIANA

H. A. THRUSH & CO., Dept. A,
Peru, Indiana _____ *19*___

Send me catalog and full information about Thrush System of Hot Water Heating

*Name*_____

*Address*_____

Strong parents bear sturdy offspring. Heat Transfer Products, Inc., a division of the Staten Island Shipbuilding Company, began its career, not as an infant, but with the strength and resources of a thirty-three-year old organization. ¶ Building heat transfer apparatus is not new to its engineers. ¶ Probably no other organization has been as deliberately planned, as carefully built and as completely equipped to produce the many types of apparatus used for the storage and transfer of heat. ¶ The personnel of the Company comprises only men who have written heat transfer history. Individually they are outstanding in their respective work. Collectively they are an authority on every phase of heat transfer manipulation. ¶ When you consult Heat Transfer Products, Inc., you may do so with the full assurance that no better engineering ability is anywhere available. ¶ And remember, when you place contracts with this Company you are dealing with an organization of unquestioned trustworthiness, ability and

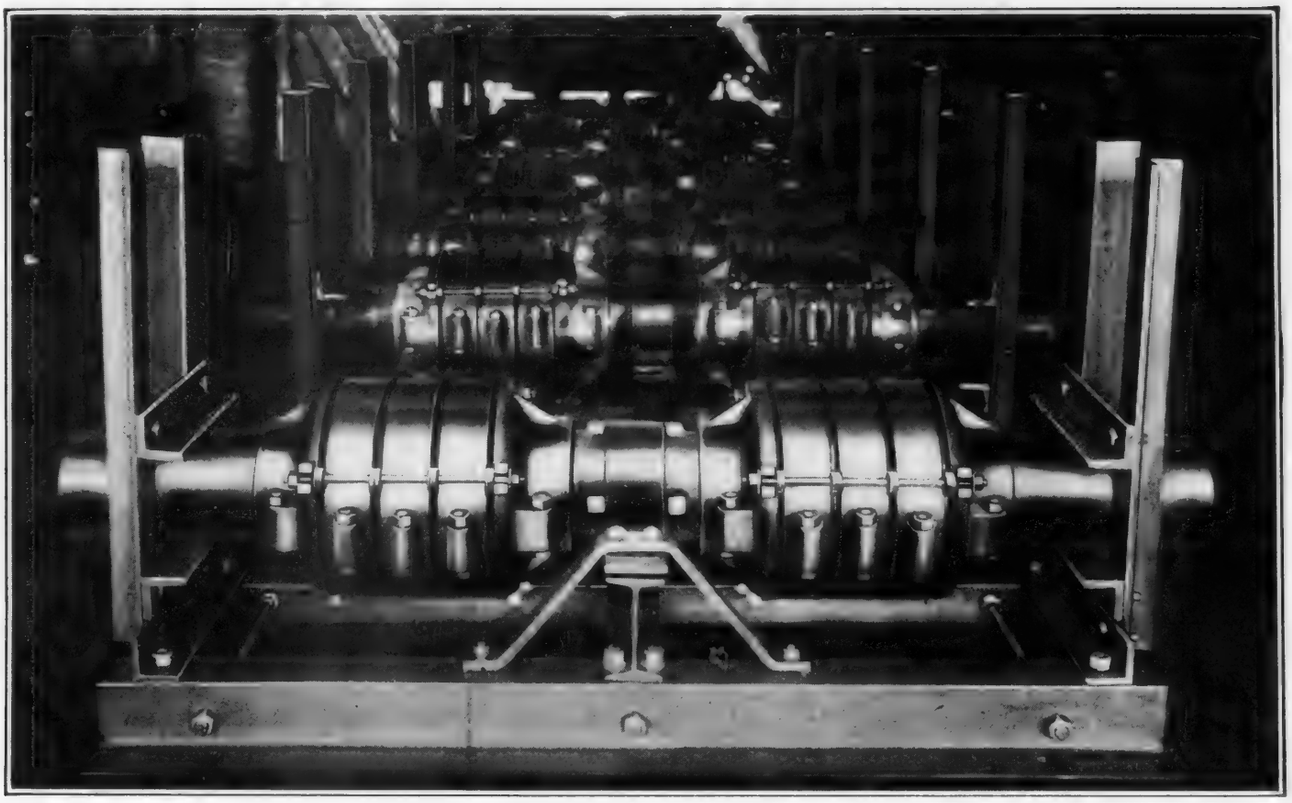
STRENGTH

Engineering data and estimates will be gladly furnished on equipment for the following applications:

Power Plants	Chemical Plants	Refrigeration
Oil Refining	Air Conditioning	Textile Mills
Gas Plants	Heating and Ventilating	Laundries, etc.

Send for information on the type of apparatus in which you are interested.

HEAT TRANSFER PRODUCTS, INC.
A division of THE STATEN ISLAND SHIPBUILDING COMPANY, 90 West Street, New York



Shipped—Ready to weld into your pipe lines

BADGER Double Self-Equalizing Flangeless Expansion Units *(complete with anchor and guides)*

These flangeless and packless expansion units are mounted on a structural steel base, which supports the anchorage and the angle iron guides for keeping the expansion elements in true alignment. The base may be embedded in concrete or bolted to a concrete foundation block. The open pipe ends are scarfed and ready to be welded into the pipe line.

The deeply corrugated one-piece seamless copper tube expansion elements contract and elongate freely, with the pipe line movement. External equalizing rings distribute the expansion uniformly, among all the corrugations.

Guaranteed for working pressures to 200 lb. Furnished either with or without center service outlet. Can be supplied with Monel Metal internal telescoping sleeves for superheated steam. *Write us for Bulletin*

Badger Engineering Service Badger engineers are designers, manufacturers and installation experts for the following and kindred power plant products:—Pipe Bends, Chemical Apparatus, Copper and Sheet Metal Work and Copper Boilers.

E. B. BADGER & SONS CO., 75 Pitts St., BOSTON, MASS.

New York: 271 Madison Ave. **Tulsa, Okla.: Mid-Continent Bldg.** **Toledo: Ohio Bldg.**

Representatives in all principal cities

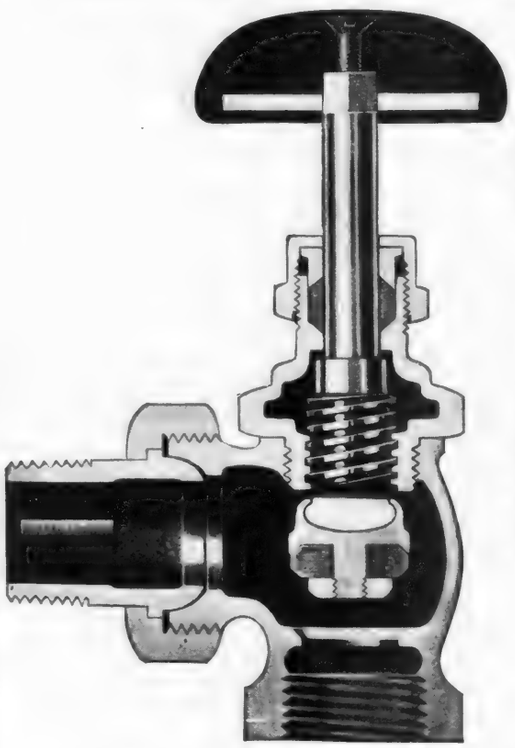
BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E. B. BADGER & SONS COMPANY · TRADE MARK

Something Entirely New

MARSH SPECIAL CONE DISC STANDARD RADIATOR VALVE

A Strictly High Pressure and 100% Quality Radiator Valve at Popular Competitive Prices



All Material, Workmanship and Finish are the Same as for Our Regular Packless and Modulated Lines.

Please Note Construction

Cone Disc; Bevel Seat; Lift; Drainage; Large Stem Diameter; Quick Opening; Overhanging Bonnet Hexes and Full-Sized Packing Chamber with Gland Follower.

All Important and Valuable Points

Fig. 150—Angle
Fig. 250—Globe
Fig. 350—R. H. Offset
Fig. 450—L. H. Offset
Fig. 550—Back Offset

Radiator Valve EFFICIENCY and ECONOMY depend upon TWO VITAL POINTS

FIRST: Seal against leakage through Valve Seat, and
SECOND: Against leakage of steam, water or gases from system through bonnet or around valve stem; further against the taking in of air in a vacuum system, through stuffing-box nut.

NOW, AS TO THE FIRST POINT

Marsh Cone Discs will not crack, or Valves leak through seat.

NOW, AS TO THE SECOND POINT

We call particular attention to the **full sized packing chamber with gland follower,** the strongest high pressure construction used for mill supply or power valves, as against **no packing chamber,** just simply a ring or disc placed on top end of bonnet, around stem in the ordinary standard competition valve.

Leakage through Valve seat or around Valve stem, either out or in, is **lost efficiency and increased fuel cost.**

These Valves will not leak at seat or around stem.

EVERY VALVE IS FULLY GUARANTEED.

MARSH VALVE COMPANY

DUNKIRK ***General Sale Distributors*** **NEW YORK**

Edward T. Hetherington
1718 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

United States Radiator Corp'n
General Offices: Detroit, Mich.

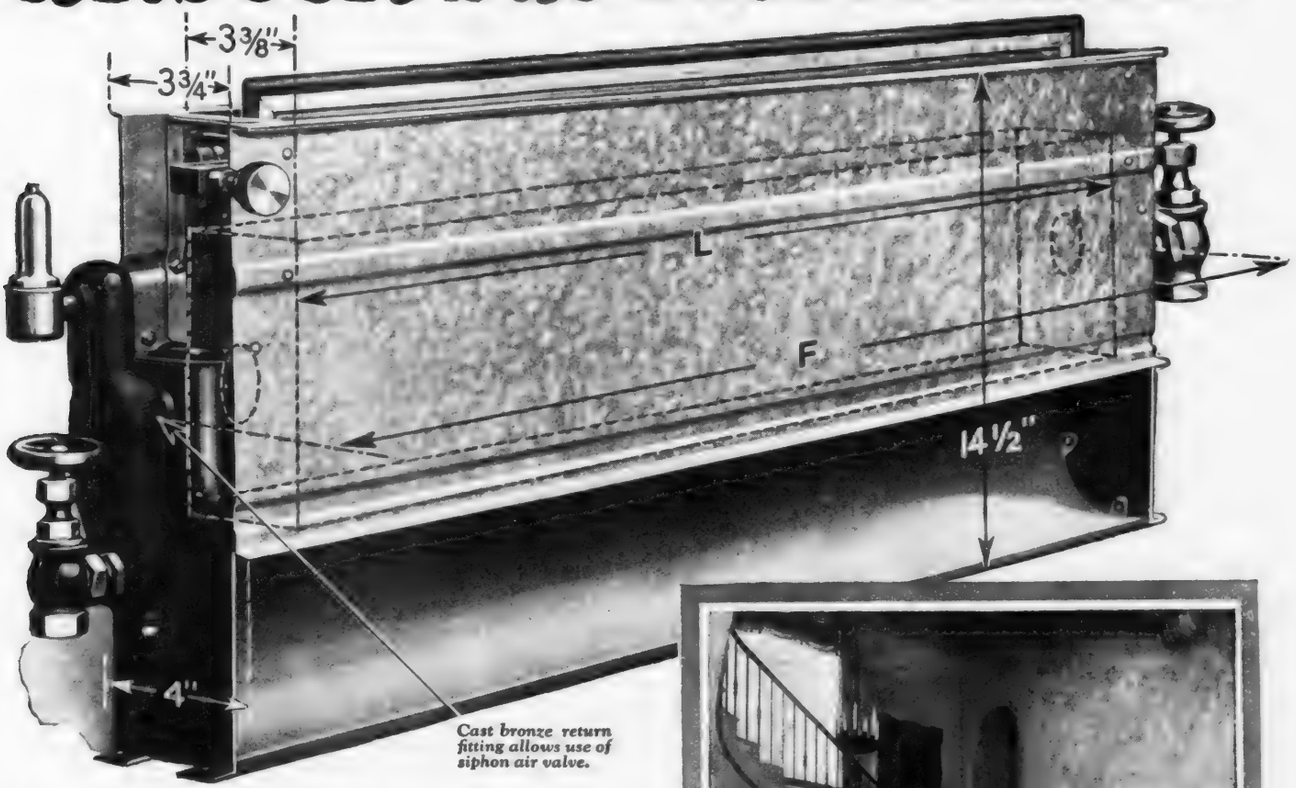
Jas. P. Marsh & Company
118 So. Clinton St., Chicago, Ill.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, "Chicago, Illinois."

Taylor-Forbes Company, Guelph, Ont., Canadian Agents

Unseen *but Accessible!*



Cast bronze return fitting allows use of siphon air valve.

An In-Wall Heater— But NOT Walled In!

ANOTHER step forward in heating practice! Circulair is a self-contained unit in rugged casing, easily handled and installed, safe against damage and *immediately accessible at all times.* In wall or cabinet, this rigid casing takes all the strains of pipe connection and insures satisfactory, trouble-free service under all conditions.

Six Distinct Advantages

[1] *Oval Copper Tube*—straight, seamless and free from recesses—insures even distribution of heat over entire plate areas and permits free circulation of air.

[2] *Removable Wall Panel* permits immediate access to heater and piping.

[3] *Cold-Air Deflector* increases over-all efficiency seven per cent.

[4] *Self-Contained Unit* (consisting of heater, deflector and damper), mounted in heavy casing, prevents damage in handling and simplifies installation.

[5] *Air-Tight Damper* on heater itself prevents leakage, cutting off heat entirely when closed.

[6] *Air-Valve Return Casting*—of heavy cast bronze—allows use of siphon air valve with its consequent fuel economy and trouble-free operation.

Send for complete data and illustrated catalog describing revolutionary improvements to be found in Circulair. Designed and developed by Willis H. Carrier, dean of scientific air conditioning. CIRCULAIR HEAT, Incorporated, 218 Central Avenue, Louisville, Kentucky.

By the use of an in-wall Circulair, the sweeping grace of this stairway has been preserved. Yet the unit is easily accessible.

Circulair HEAT

Use This

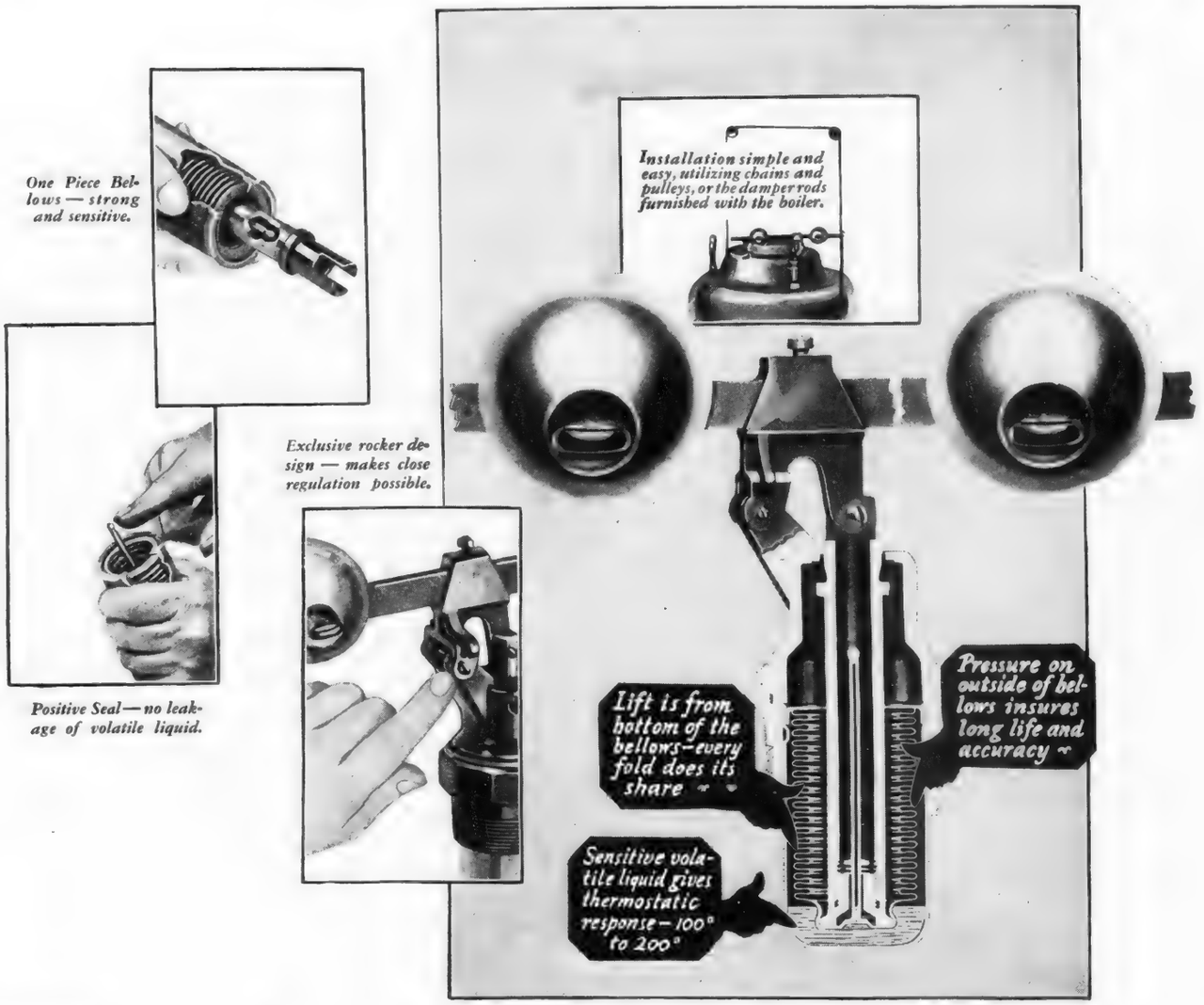
CIRCULAIR HEAT, Incorporated, 218 Central Avenue, Louisville, Ky.

Send, without obligating me, catalog and complete data on Circulair Heat Units.

Name.....

Address.....

City..... *State*.....


One Piece Bellows — strong and sensitive.
Positive Seal — no leakage of volatile liquid.
Exclusive rocker design — makes close regulation possible.
Installation simple and easy, utilizing chains and pulleys, or the damper rods furnished with the boiler.
Lift is from bottom of the bellows—every fold does its share
Sensitive volatile liquid gives thermostatic response—100° to 200°
Pressure on outside of bellows insures long life and accuracy

Why do the system companies include a Water Regulator?

—because they know it is essential to the reputation of their system. It saves fuel by preventing overheating. It provides comfort by keeping the water temperature steady. And it eliminates the task of frequently adjusting drafts.

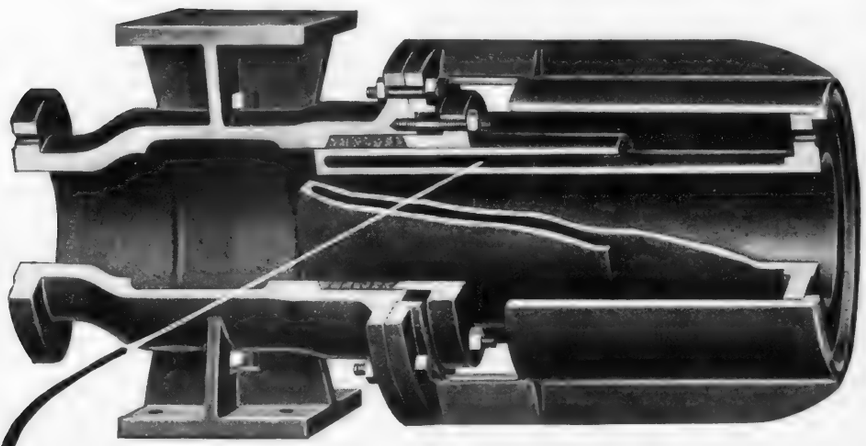
Draft control is automatic when the ARCO Water Regulator is installed, and water temperature can be maintained constant at any point between 100 degrees and 220 degrees Fahrenheit.

The principle of operation is very simple. An expansible metallic bellows surrounded by a volatile liquid expands and contracts as the water temperature changes. As it moves, it actuates the weighted lever and automatically opens or closes the drafts as often as may be necessary to maintain the desired temperature.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

816-820 South Michigan Avenue Chicago, Illinois



Air Cooled Slip

Eliminates Excessive Packing and Maintenance Costs

HEAT is responsible for deterioration of packing in an expansion joint. High pressure and superheated steam requires an expansion joint designed to prolong the life of the packing.

This problem has been solved by the ADSCO design of the Duplex Joint, in which the air cooled outer sleeve bearing against the packing is maintained at a considerably lower temperature than the inner sleeve which conveys the steam.

Many of these joints in use on lines carrying up to 400 lbs. pressure and 900° temperature are eliminating excessive packing and maintenance costs. Lower priced packing can be used. The intervals between gland adjustments are lengthened.

Engineers are specifying the ADSCO Duplex-Sleeve Guided Expansion Joint not only for superheated service but wherever additional protection against wear of packing is desired.

The ADSCO Duplex-Sleeve Guided Expansion Joint is one of several hundred ADSCO Expansion Devices for pipe lines conveying steam, water, oil, air and other gases and liquids.

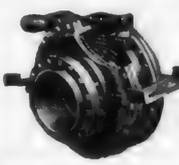
ADSCO

DUPLEX-SLEEVE GUIDED EXPANSION JOINT

For High Pressure and Superheated Steam

Write for Valuable Reference Book

– the ADSCO Blue Book on expansion. Gives tables which are invaluable to any engineer who specifies Expansion Joints.



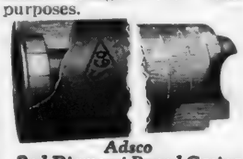
Adsco Expansion Variators

Will outlast the line itself and render uninterrupted service. Packingless design. For pressure ranges up to 125 lbs.

Adsco Nelson Gate Valve

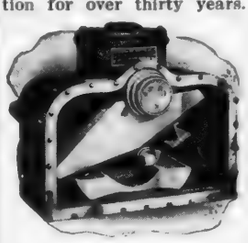
for 400 lbs. Working Steam Pressure

Outside screw and yoke design with rising stem and long condensing chamber. Solid wedge type. Other designs for other purposes.



Adsco
Red Diamond Brand Casing

An efficient insulation and durable wood conduit. In hundreds of installations has given efficient insulation for over thirty years.



Adsco
Simplex Condensation Meter

Accurately records steam used by metering the condensation. If live steam is to be measured, use the St. John Steam Flow Meter.

CONSULT OUR ENGINEERS' SERVICE DEPARTMENT

TO further the sale of ADSCO Products for steam distribution, we offer our fifty years' experience in the district heating field to engineers who are confronted with problems of steam distribution. Let us know what your problem is and we will help you solve it.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

Offices and Agents in Principal Cities

SPECIALISTS IN STEAM DISTRIBUTION FOR OVER 50 YEARS

MERCOID
System of
DIRECT CONTROL

Theaters of every size will obtain perfect regulation of temperature through the use of Mercoid Controlled unit heaters.

For UNIT HEATERS IN THEATERS

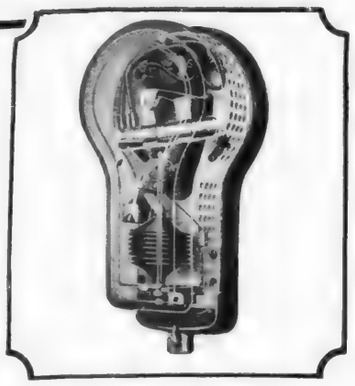
Above many other things, theater patrons demand comfort. Uniform temperatures and proper ventilation are most necessary to this comfort. And if the unit heaters are automatically controlled, proper heating is assured.

In this connection, Mercoid Thermostats permit the highest possible efficiency of automatic control. Mercoid Thermostats for motors of 1 h.p. or less, within guaranteed ratings, for normal working loads of 10 amperes at 110 volts, or 5 amperes at 220 volts, either A.C. or D.C., thereby eliminating the use of relays or remote controls.

Regularly furnished with standard scale 56° to 80° with 2° markings and with a guaranteed operating differential of 2° at any point on the scale. For lower temperatures a range of 38° to 60° is available.

Furnished with thermometer when specified.

Write for full information regarding Mercoid Thermostats for positive Control of Unit Heaters.



Mercoid Thermostat—Figure 21. Standard range 56° to 80° F. Operating Differential of 2°.

Mercoid Boiler Control—Figure 31. Pressure Type for Steam and Vapor Boilers.

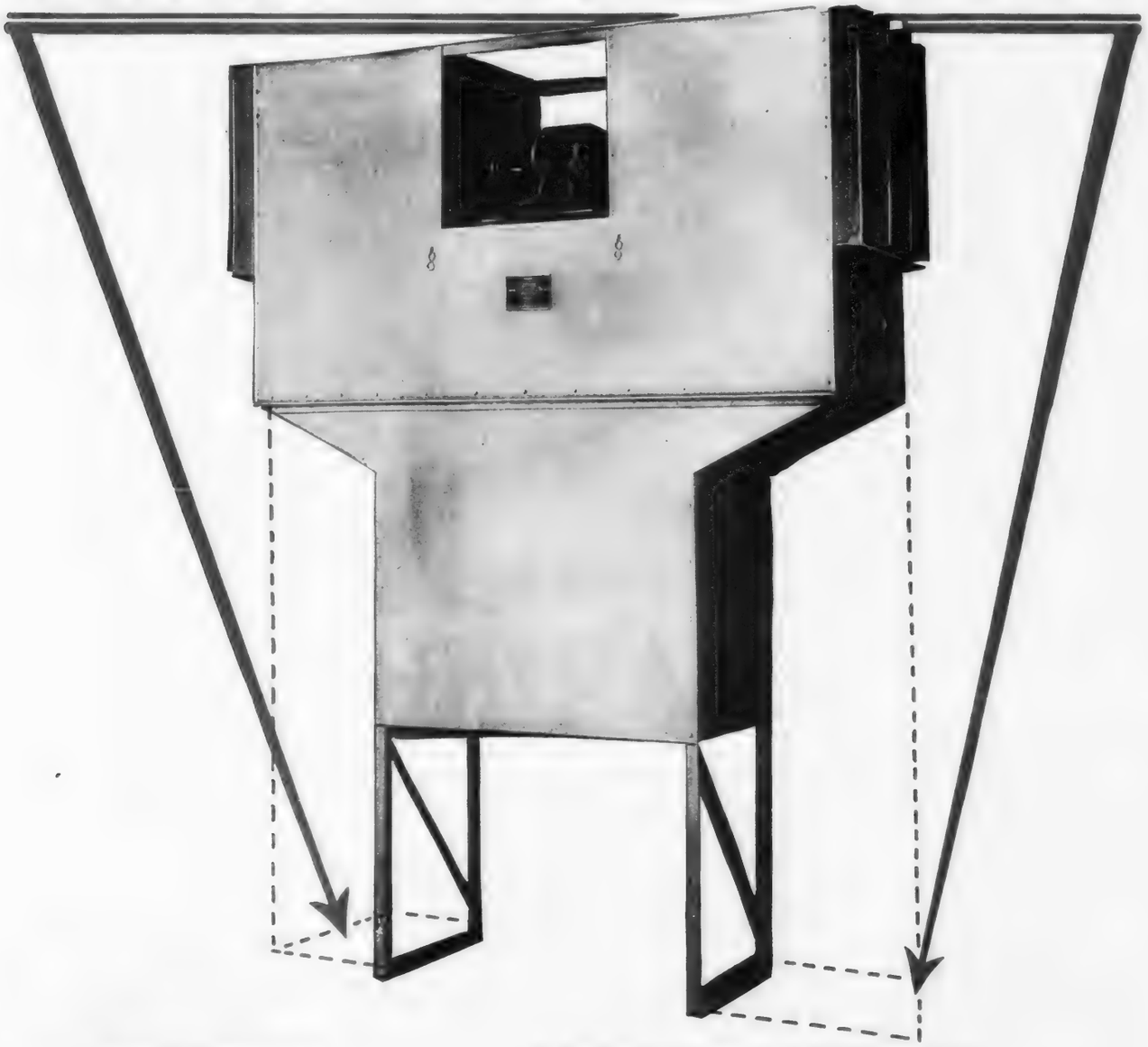
THE FEDERAL GAUGE COMPANY

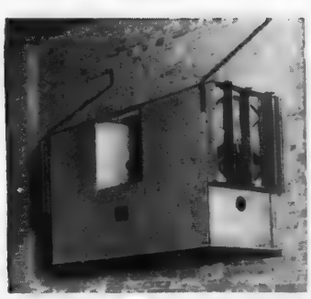
564 West Adams Street
Chicago, Ill.

MERCOID

25 Church Street
New York City

FLOOR SPACE SAVED





A Striking example of Refinement in

TWINFAN Unit Heater Design

The illustration plainly shows the reduced floor space occupied by the improved TWINFAN Unit Heater. The base construction has been reduced to the smallest possible size, consistent with an air inlet of ample area.

The improved TWINFAN Unit Heater features many other refinements as important as this one of floor space saved.

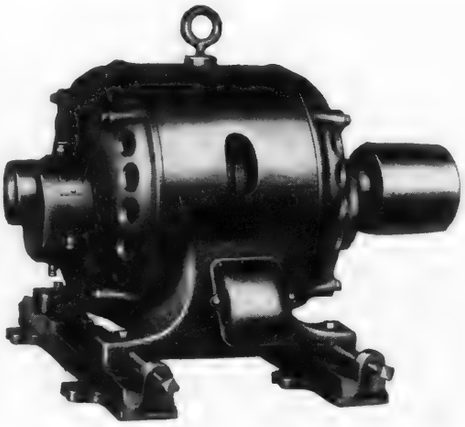
Our Bulletins Nos. 201 and 202 describing these refinements are yours on request.

DWYER EQUIPMENT CO.

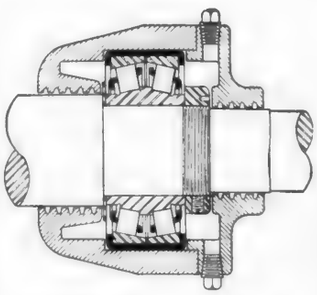
4534 W. NORTH AVE. CHICAGO, ILL.

HEAT WITH TWINFAN UNIT HEATERS

"They Keep a-Running"

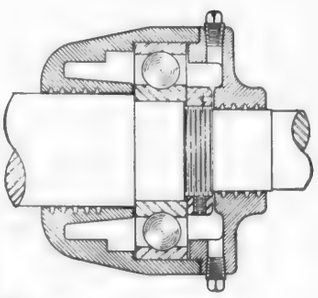


10 Horse Power, 3 Phase Squirrel Cage Motor



TIMKEN

Double Row Self Contained Roller Bearing.



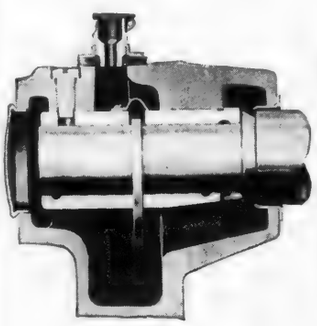
New Departure

Self Contained Ball Bearing.

A BEARING for EVERY PURPOSE

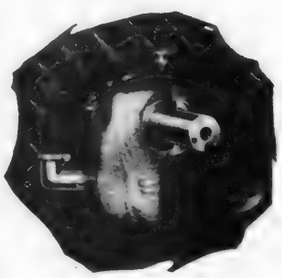
CENTURY ELECTRIC COMPANY
1806 PINE ST. ST. LOUIS, MO.
For More Than 24 Years at St. Louis

Century MOTORS



Century

Phosphor Bronze Bearing —Ring Oil Lubrication.



Century

Phosphor Bronze Bearing with Century Wool Yarn System of Lubrication.

THERE IS A DECIDED DIFFERENCE

TENTACULAR

"Higher efficiency in Power Transmission"

Cut illustrates Tentacular driving a Fan at Krout & Fite Mfg. Co. Plant, Phila., Pa.

TENTACULAR Transmission is used in heating and ventilating work in places where requirements are unusually severe.

TENTACULAR solves the problem because there is practically no limit to the speed at which it can be run. Its efficiency remains constant, whether operating at 1000 F.P.M. or 7000 F.P.M.

TENTACULAR will reduce slippage to a minimum because of its special construction.

TENTACULAR does not require special equipment or pulleys. Considerable space saving ordinarily can be effected because Tentacular will operate on very short pulley centers where the pulley ratio is unsually high.

TENTACULAR is extremely quiet in operation—a most important feature in connection with ventilating work.

Our Engineering Department will be glad to work with you in determining the advantages and economies of Tentacular Transmission where fan and blower drives are hardest. Send for catalog.

Showing the soft green leather strips, secured by *hollow* rivets to the sturdy backing — the reason for the powerful adhesion and efficient power transmission of Tentacular.

Manufacturers of a complete line of leather belting

Alexander Brothers, (INC.)

14 SOUTH STREET, PHILADELPHIA, PA.

Branches and Distributors in all principal Cities.

The 7 prerequisites of the ideal Fan System Heating Surface and how AEROFIN approaches that Ideal!

1. Non-Corrosive 2. Light Weight 3. Compact
4. Strong and Durable 5. High Heat-transmitting Capacity
6. Encased Unit Design 7. Ease and Economy of Installation

5-HIGH HEAT-TRANSMITTING CAPACITY is obtained in Aerofin (1) by the exclusive use of non-ferric metals having a rate of heat transmission about *eight times* that of cast iron; (2) by the scientific design of the crimped helical extended surface; and (3) by the equally scientific use of restrictive orifices in the entering ends of the straight, unobstructed tubes, insuring absolutely uniform distribution of the heating medium.

Thus Aerofin responds to control, manual or automatic, with remarkable rapidity and uniformity, and is so skilfully adapted to its purposes that it has completely revolutionized Fan Engineering in all its branches.

A new Bulletin, No. 7, affords a complete description of Low Pressure Aerofin and presents eighteen Piping Diagrams in four colors, representing the coordinated experience of the foremost Engineers in the United States.

Bulletin H. P.-1 describes High Pressure Aerofin and contains complete Technical Data with large Temperature Effects Chart on linen.

Either or both of these Bulletins will be mailed, gratis, to recognized firms or individuals, upon request.

AEROFIN CORPORATION

750 Frelinghuysen Avenue
Newark, N.J.

39 Cortlandt St. New York
Burnham Bldg Chicago

AEROFIN is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

Whatever you've wished for in a Fan System Heating Surface you'll find in Aerofin!

Armstrong traps are ideal for heating units

DUE to their unique construction based on the inverted bucket principle, they are water sealed at all times and automatically discharge air, oil and dirt with the condensate. Live steam can not get to the valves and escape. The compound leverage permits a small compact unit with a large capacity. Condensation losses are therefore a minimum. Because of the small size, they fit almost anywhere and require no supports other than the pipe line itself. The installation is compact and neat.

Armstrong Traps are simple and sturdy. Heat treated chrome steel valves and seats insure against leakage and give years of trouble-free service. They are economical with the coal pile and require practically no upkeep.

Thousands of Armstrong Traps are used in hundreds of industries, and everywhere engineers say, "They are the best we can buy."

Armstrong Traps draining steam line and unit heaters in large industrial plant.

Test an Armstrong for 90 days at our expense. Send the coupon.

ARMSTRONG MACHINE WORKS

346 Maple Street, THREE RIVERS, MICHIGAN

District Representatives in 36 Cities

Armstrong Machine Works,
346 Maple St., Three Rivers, Mich.

Please ship prepaid an Armstrong Trap for a 90-day test. When the test is completed the trap will be returned collect.

For service on .....

Size of pipe.....Steam Pressure (Maximum)....

Name and Position .....

Firm .....

Street Address .....

City and State .....

☐ Send Catalog.

H & V 2-Gray

The Lad's there with fight and flight

"Here, Lad—

the facts and figures on last year's motor production ought to settle our disagreement about what make of motors we will buy. The Big Company I insist on buying motors from leads—and the 'Linc-Weld' motor you're boosting is below it in sales volume. Money talks and your people didn't get it. Mine did."

"Yes, Pop—

figures prove you're right, but *facts* tell a different story.

The majority in any line doesn't prove whether it's the right auto, the right alderman or the right motor.

Mob thinking isn't thinking at all.

Making a double size bearing in a motor to cut down bearing troubles, as in the 'Linc-Weld', is an improvement for those who think.

Putting more active material and better insulation into 'Linc-Weld' than any motor made is far better *for us* than the surface gloss that attracts the majority.

And that 'Linc-Weld' didn't receive the biggest purse proves *exactly* the same thing as the following figures:

Tunney got	$1,000,000
Lindbergh	25,000

You can't prove the value of a job by the gate receipts."

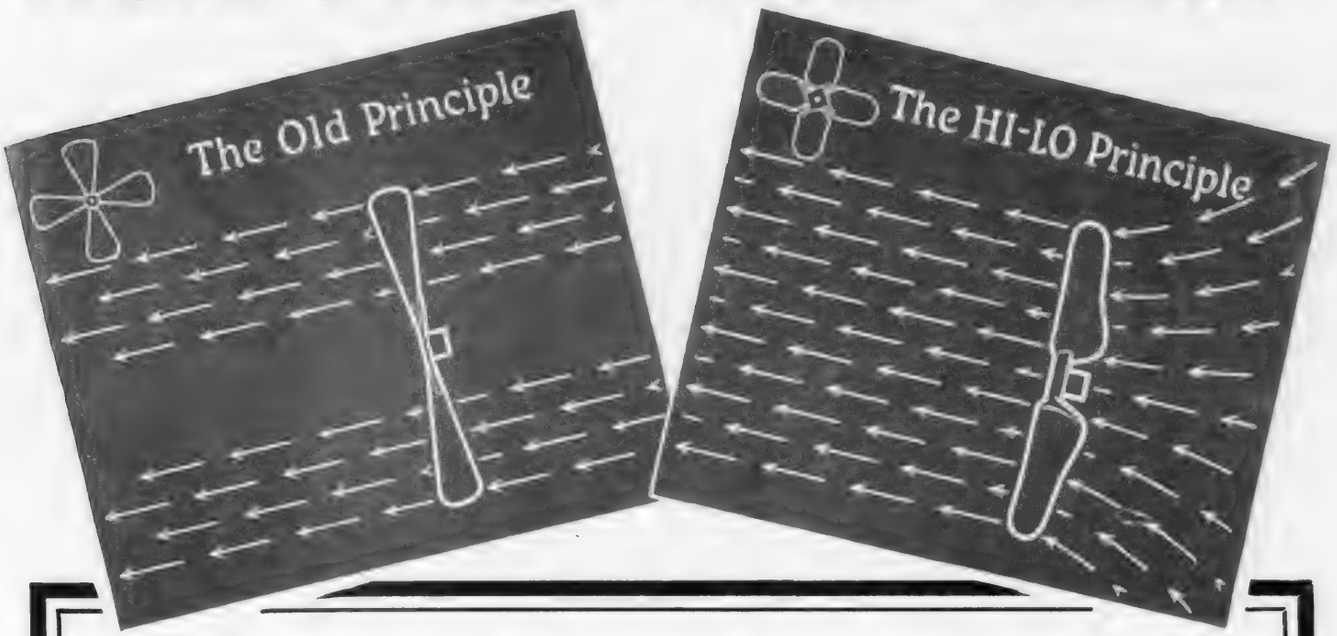
The Lincoln Electric Co., Dept. No. 16-2, Cleveland, Ohio

M-8

"Linc-Weld"

LINCOLN MOTOR

HERE'S THE WHOLE STORY!



A STUDY of the diagrams above will show why the **Super Hi-Lo Propeller Fan** achieves such an all-round high efficiency. To the Engineering mind . . . and those familiar with fan problems . . . it tells the whole story. By an equalization of air thrust from hub to tips, and the action of the air cups close to drive shaft or source of power, all parts of the fan wheel are doing effective work. It is the principle of the bird's wing at last applied to fan construction.

The **Super Hi-Lo Propeller Fan** drives a solid shaft of air instead of a ring . . . it draws air from a wider area and distributes it in greater volume. It supplies the **three** big needs in fan construction . . . **Larger air capacity—Less power consumption—Silent operation!**

Write on your business letter head, stating purpose in which you are interested, and complete information with our new illustrated folder "A New Era in Ventilation" will be sent without obligation.

To Manufacturers Using Fan Blades

The **Super Hi-Lo Propeller Fan** is now available for all purposes. In addition to the standard four-blade type we can supply fan wheels of any size with any number of blades.

Tell us what you want and we will supply, without obligation, a model with which you can make your own tests.

Distributors and Dealers!

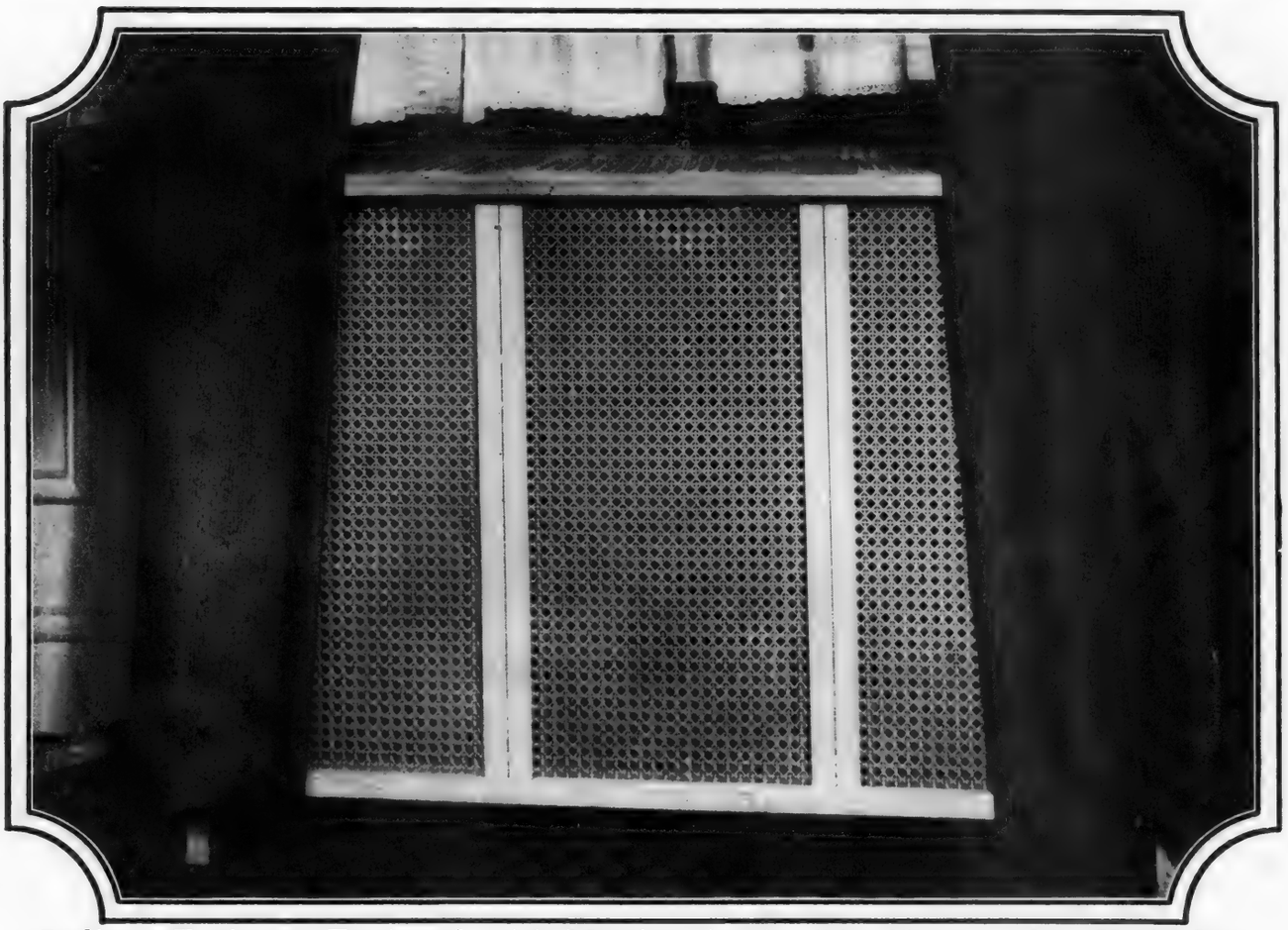
The rapid increase in the use of the Super Hi-Lo Propeller Fan in the Heating and Ventilating Field permits us to offer an excellent opportunity to Distributors, Manufacturers' Agents, and Dealers. Exclusive selling franchise granted in your territory. Write or wire for details at once.

SINCLAIR EQUIPMENT CORPORATION

Manufacturers of Super Hi-Lo Propeller Fans—Heating and Ventilating Systems

General Offices and Plant: 500 So. Peoria Street, Chicago, Ill.

The Super HI-LO
A New Basic Principle in FAN Blades



Radiator Enclosure Equipped with Metalace in the Ritz Tower, New York City

EMERY ROTH, Architect TODD ROBERTSON & TODD ENGINEERING CORPORATION, Builders

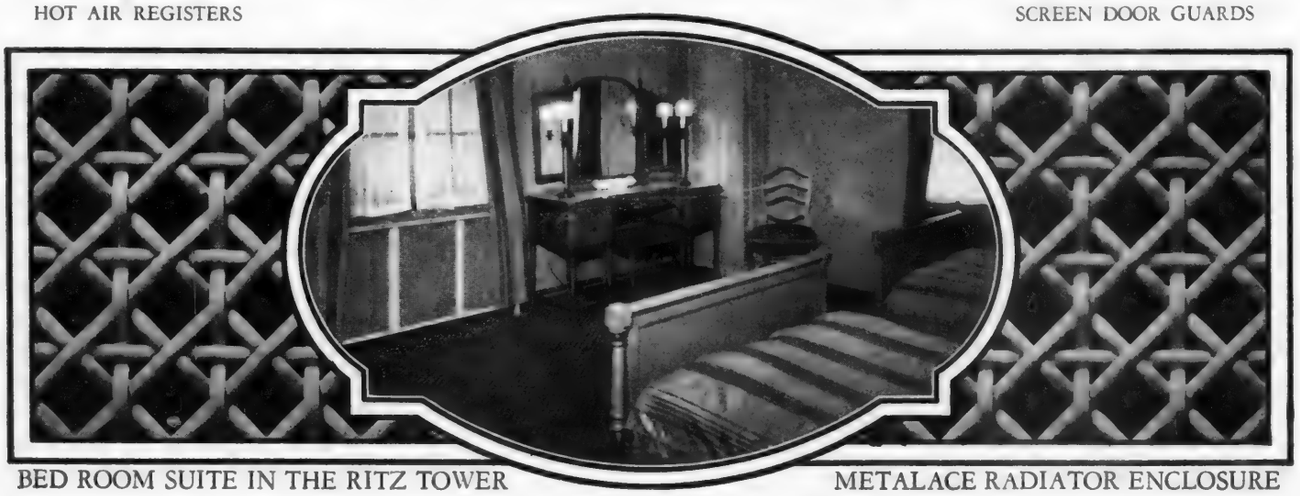
Throughout this Country and Abroad Metalace is the Standard for all Forms of Radiator Enclosures and Heating Installations

Write for Illustrated Catalog with New Metalace Patterns in steel or bronze

THE METALACE CORPORATION
SOUTH BOSTON, MASS.
NEW YORK OFFICE—101 PARK AVENUE

Specify Metalace for
RADIATOR ENCLOSURES
VENTILATORS
HOT AIR REGISTERS

Specify Metalace for
INTERIOR PARTITIONS
CASHIERS' CAGES
SCREEN DOOR GUARDS



BED ROOM SUITE IN THE RITZ TOWER METALACE RADIATOR ENCLOSURE

Residence of J. K. Shaw, Minneapolis, Minn.

Today Trane Concealed Heaters.

in the new distinctive homes and apartments

These modern Trane units are being installed in constantly growing numbers, because they meet the double problem which now confronts heating men. Fashion has decreed that exposed radiators must go. Architects and owners know about inconspicuous, space-saving heating units and are determined to have them, in all types of buildings. But they also demand greater comfort than ever before. When you install Trane Concealed Heaters between the walls, everybody is happy. An easy installation for the contractor—then more beautiful rooms, more comfortably heated. The combination people want today. Write for bulletin 24.

Trane Concealed Heater with the patented Trane copper heating element.

THE TRANE COMPANY (Est. 1885) 206 Cameron Ave., La Crosse, Wis.

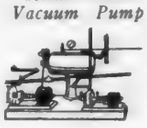
HEAT CABINETS **TRANE** CONCEALED HEATERS

··· PUMPS AND HEATING SPECIALTIES ···

Trane Bellows Trap

Trane Bellows Packless Valve

Trane Bellows Trap—Offset Pattern



Trane Duplex Return Line Vacuum Pump

Trane Duplex Condensation Pump

Trane Type "VM" Multi-Stage Centrifugal Pump

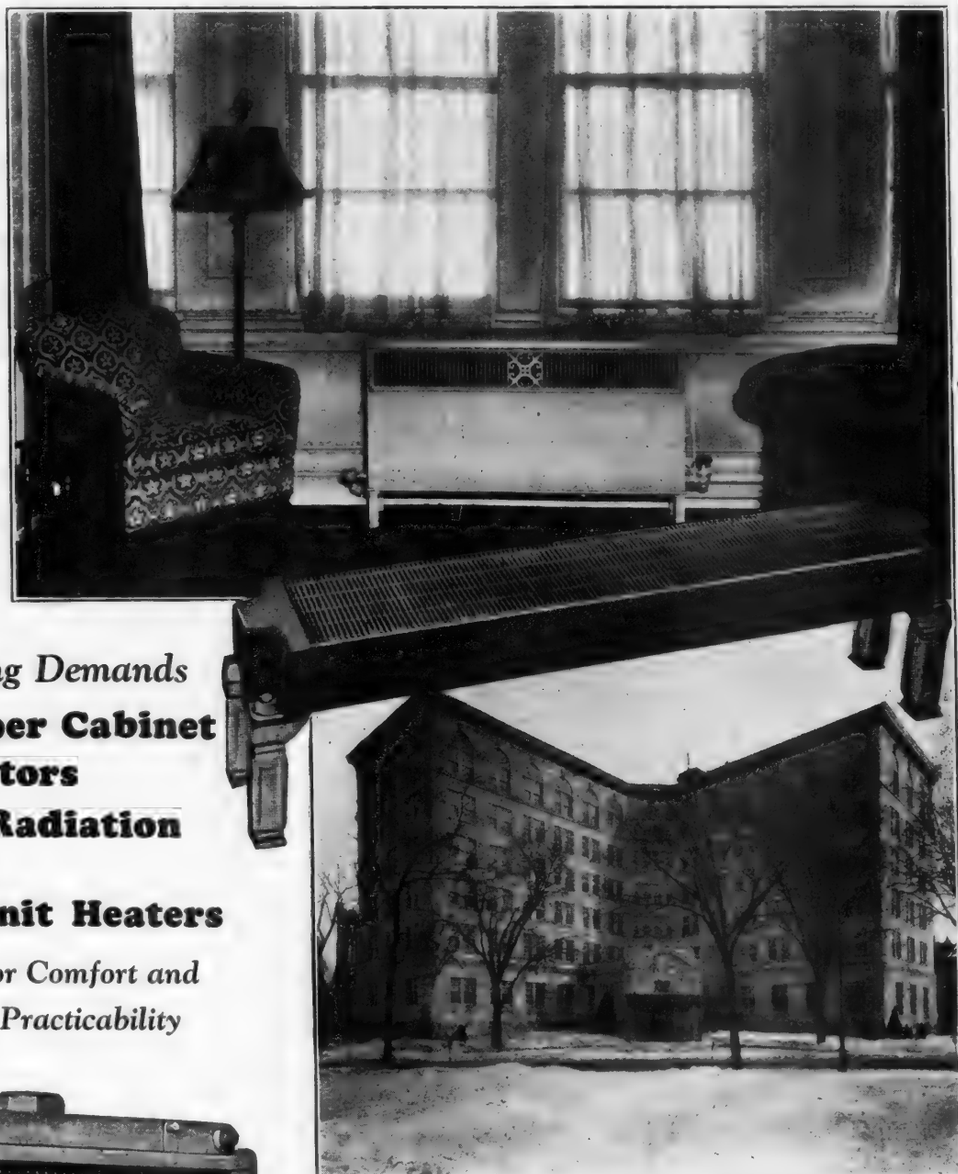
Trane Unit Heater—ceiling type

Trane Unit Heater—floor type

Five Ten Groveland
Minneapolis

Engineers
G. M. ORR & CO.
Contractor
LAMB, P. & H., CO.
Architects
LARSON & McLAREN

342
McQUAY
Cabinets
Installed



Modern Heating Demands
McQuay Copper Cabinet
Radiators
Concealed Radiation
or
McQuay Unit Heaters
for Beauty—for Comfort and
Present-day Practicability

Front View—Showing Adjustable Deflectors
Units Now Furnished with Four Deflectors

McQUAY RADIATOR CORPORATION

General Sales Office
Pure Oil Building, Chicago

BRANCH OFFICES

Minneapolis, Minn.
1600 Broadway, N. E.
(factory)
623 New York Life Bldg.

Milwaukee, Wisc.
480 Market St.

Omaha, Neb.
1803 St. Mary's St.

St. Louis, Mo.
410 Granite Bldg.

Detroit, Michigan
712 Stephenson Bldg.

Pittsburgh, Pa.
Century Bldg.
Bushnell Machinery Co.

Muncie, Indiana
634 Ohio Ave.,
Knapp Supply Co.

Cleveland, Ohio
291 E. 149th St.

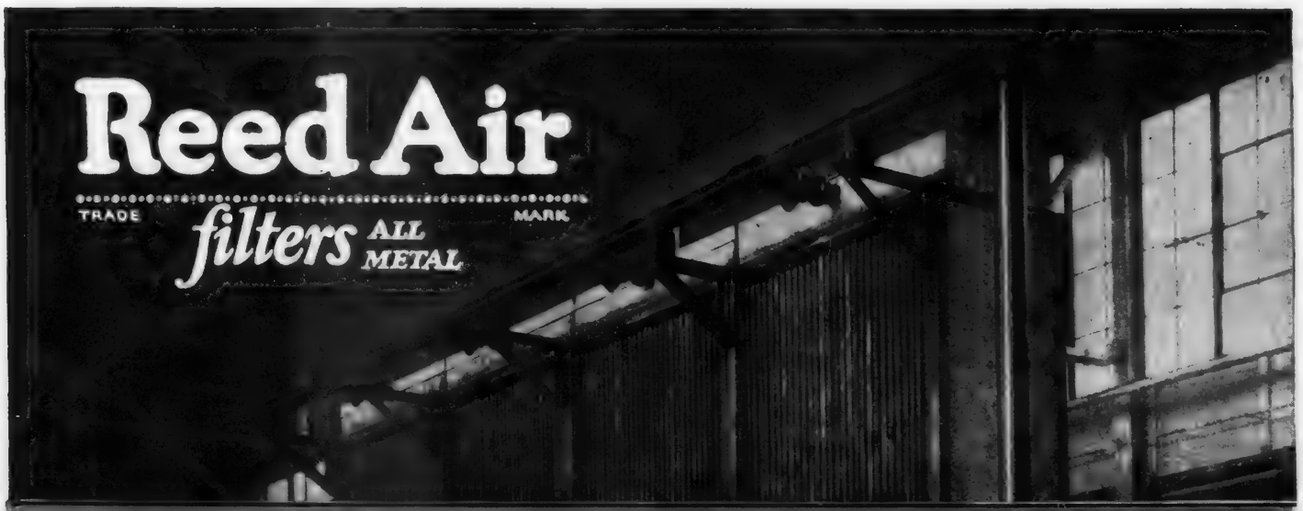
Newark, N. J.
739 Broad St.

Boston, Mass.
31 State St.

Washington, D. C.
1125 Press Bldg.

Reed Air filters

TRADE MARK ALL METAL



THIS TEST YOUR PROTECTION

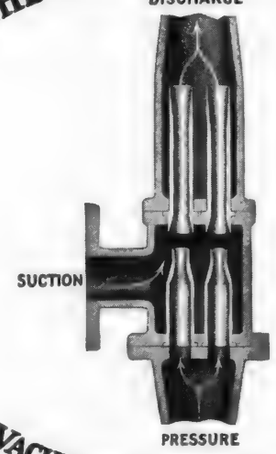
EVERY Reed Self-Cleaning Air Filter is completely erected and tested before leaving our factory. In this way thoroughly satisfactory service is assured from the beginning. Permanent installation is then simply a matter of assembling, all piping having been cut to proper lengths and threaded for connection.

The most convincing evidence of the high efficiency, low resistance and positive performance of the Reed Streamline Self-Cleaning Filter is the fast-growing list of satisfied users. This illustration, for instance, shows part of a 300,000-C.F.M. installation being factory-tested for one of the largest department stores and warehouses in the middle west.

Send for complete information about this revolutionary air-cleaning device — made by the manufacturers of the Reed Standard Unit Filter, 200,000 of which are now in regular use.

REED AIR FILTER COMPANY, *Incorporated,*
218 Central Avenue, Louisville, Kentucky.
Offices in Principal Cities

THE DUNHAM EXHAUSTER



VACUUM PRODUCING ELEMENT

The Dunham Exhauster, operating on the jet or ejector principle, possesses the highest efficiency of any vacuum producing element practical for use in a high vacuum pump. It is in fact the only device of its kind that enables today's high vacuums to be successfully maintained. It contains no moving parts, is not subject to appreciable wear, and its efficiency is uniform under all conditions likely to be encountered in a heating system.

An Essential Requirement of Modern Vacuum Heating

VACUUM return line systems of heating, which have been standard for a number of years, require a vacuum producing element with capacity not much in excess of ten (10) inches of vacuum. Sub-atmospheric heating, now becoming standard, has made a new demand and requires a pump capable of producing and maintaining high vacuums up to twenty (20) and twenty-five (25) inches.

The Dunham Vacuum Pump, utilizing the Dunham Exhauster or Vacuum Producing element, meets today's high vacuum needs because it handles condensable gases as well as air, which is only a small part of the load such a vacuum pump must handle. Condensable gases must also be handled.

The only known method by which this may be done is by drawing these gases into the water stream, thereby condensing them, thus turning a troublesome factor into a means of creating still higher vacuums.

The Dunham Exhauster, operating on the jet or ejector principle, possesses the highest efficiency of any vacuum producing element practical for use in a high vacuum pump. It is in fact the only device of its kind that enables today's high vacuums to be successfully maintained. It contains no moving parts, is not subject to appreciable wear, and its efficiency is uniform under all conditions likely to be encountered in a heating system.

Look for the Name
DUNHAM
This nameplate identifies a genuine DUNHAM Radiator Trap

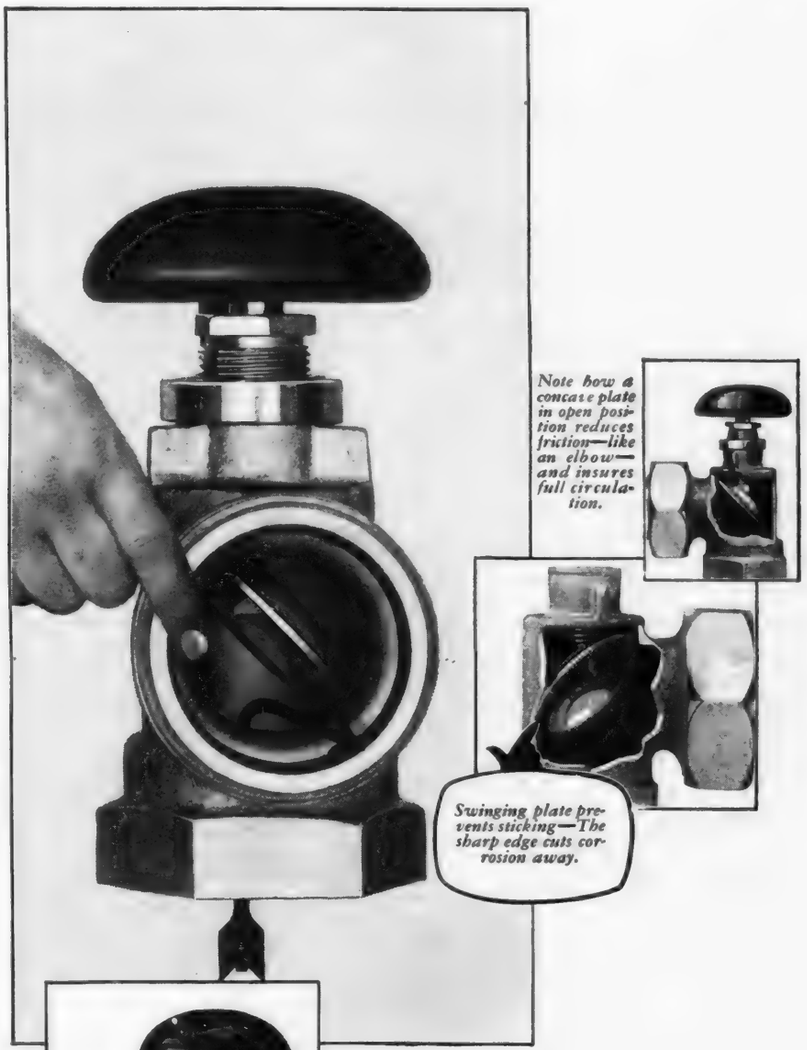
Over seventy branch and local sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

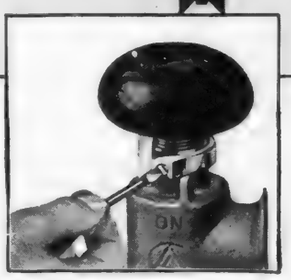
C. A. DUNHAM CO.

DUNHAM BUILDING

450 East Ohio Street, Chicago

Balance Every Hot Water Installation *with* *Detroit Equalizing* VALVES


Note how a concave plate in open position reduces friction—like an elbow—and insures full circulation.
Swinging plate prevents sticking—The sharp edge cuts corrosion away.



Just loosen this screw to control area of opening.

DETROIT EQUALIZING HOT WATER VALVES (No. 104) give the heating contractor absolute control of circulation so that a perfectly balanced job is easily accomplished. The area of the opening through the valve can be adjusted—after installation—to meet individual radiator requirements, and then is permanently set.

Control is provided by the simple stop-collar arrangement illustrated above. When the proper amount of flow for the radiator is determined, the collar is set so that it permanently limits the opening at that point. This corrects any inequalities in the system, without expensive pipe changes.

The advantages of an installation *balanced at the valve* are tremendous. Even the most skillful engineering cannot assure uniform circulation because commercial pipe is not made in enough sizes.

The one sure, easy way to overcome this difficulty positively and economically is to balance the job *at the radiator* by using Detroit Equalizing Valves.

The additional cost is negligible—for example, $3.00 on a 10-radiator job.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

816-820 South Michigan Avenue Chicago, Illinois

Makers of ARCO Packless Valves, DETROIT Valves, ARCO Damper Regulators, AIRID Air Valves, MERCOID Controls, IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, and devices for drying, humidifying, cooling and refrigeration

Guaranteed *to rid your* Steam Installations *of* Air *and* Grief

There are two main reasons why the "Warco" No. 1 Radiator Air Valve is giving such an excellent account of itself in apartments, hotels and residences throughout the country, and why it has been chosen for some of the largest new steam installations of the past year:—

(1) It expels *quickly* the Air that steals the heat from Steam Radiators.

(2) It prevents *surely* the Grief that steals the profits from Plumbing and Heating Contractors.

Not only is "Warco" No. 1 *the most rapid-venting Air Valve on the market.* It is just as botherless and silent as it is rapid in operation, and it is *actually* automatic. When you have installed a "Warco" No. 1 on a steam radiator, your profit is *yours to keep.*

In addition to "Warco" No. 1, there are three other "Warco" Automatic Air Valves, as shown and described on this page, and three "Warco" Automatic *Vacuum* Air Valves which are equally botherless and efficient. Every one of the Seven Fool-proof "Warcos" is guaranteed, when properly installed and operated, to give five years or more of satisfactory service.

Write now for interesting folder.
"Make Your Steam Installations Do Better Work."

W. A. RUSSELL & COMPANY

Grand Central Terminal Bldg. Established 1890 New York City
Chicago Boston Pittsburgh Los Angeles

"Warco" No. 1 Air Valve, ⅛" Side Outlet—for Radiators

(This cut ¾ actual size)

Notice:—When "Warco" No. 1 is used on the radiators, "Warco" No. 3 is used on the mains of smaller systems, whereas, on larger installations, either "Warco" No. 4 or "Warco" No. 5 is used on the mains.

"Warco" No. 3 Air Valve, ¼" Bottom Outlet — for Mains, Coils and Risers

"Warco" No. 4 Quick Vent Air Valve, ¾" Bottom Outlet — for Mains and HV Stacks

"Warco" No. 5 Quick Vent Air Valve, ⅜" Bottom Outlet — for Mains and HV Stacks

(Cuts of Nos. 3, 4 and 5 Valves are ¼ actual size)

"Warco" *Automatic Air & Vacuum* Valves

TRADE MARK REGISTERED

WHY SHOP around when you can buy ALL you need in heating systems and specialties and get ONE guarantee from ONE manufacturer?

Today, the Milwaukee Valve Company, backed by 27 years of specialization in the heating field, is fully organized and equipped to render this unusual service to the heating industry.

In addition to making equipment for every size and type of heating installation the line also includes an unexcelled variety of "Milwaukee" standard brass valves, packed type radiator valves, gate, globe, angle, check valves, etc.

Get the habit of specifying and installing MILVACO *exclusively.*

Write for complete information, Dept. B

MILWAUKEE VALVE COMPANY

Manufacturers of

[*Steam or Hot Water*] COMPLETE HEATING SYSTEMS [*Vacuum or Vapor*]

Milwaukee, Wisconsin

OFFICES IN ALL PRINCIPAL CITIES

ILLINOIS
HEATING SYSTEMS

The ILLINOIS *Heat Retainor*

(BROWNE PATENT)

The only device of any description which permanently combines successfully, vacuum circulation, or steam circulation below atmospheric pressure, together with all the advantages of an open atmospheric vapor system.

The Illinois Heat Retainor embodies an entirely new operating principle and is a development exclusively our own. This perfect sealed air vent permits the free escape of air from the heating system on one-fourth ounce pressure, but is absolutely sealed against outside atmosphere. Air is water washed before reaching the valve which is in the top of the tank.

Illinois Vapor Systems offer these *proven* advantages:

—operation below atmospheric steam pressure—at vacuum vapor pressures.

—a moderate, healthful heat during mild weather, avoiding overheating common to ordinary steam jobs.

—all the heat you want in winter weather by adjusting firing periods.

—operation four-fifths of the time with banked fires.

—easy control of room temperatures.

—a remarkable fuel economy.

—durability of apparatus

—noiseless operation.

Write for Vapor Details Bulletin 22

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD. PRES. INCORPORATED 1900

BRANCHES AND REPRESENTATIVES IN 40 CITIES

CHICAGO

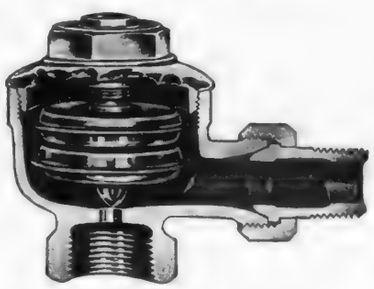
A Great Little Circulation Manager—

is the secret of FLEXIBLE *and* ECONOMICAL *heat*

Circulation is just as vital to the life of a heating system—as to the life of this magazine you are reading. A heating system has two jobs: to generate heat and to circulate heat. It's on the circulating job that most heating systems fall down: Some refuse to circulate heat to *all* parts of the system uniformly; some move the heat anywhere but only under pressure that requires extra fuel to maintain it. The Barnes and Jones Vapor System gives exactly the temperature you want in any room at any time and does it with unequalled fuel economy. First, because its Steam Vapor circulates freely with *ounces* of vapor instead of *pounds* of steam; second, because it has

A Great Little Circulation Manager—the B. & J. Thermostatic Return Valve!

B. & J. Thermostatic Return Valve



"Made like an Instrument"

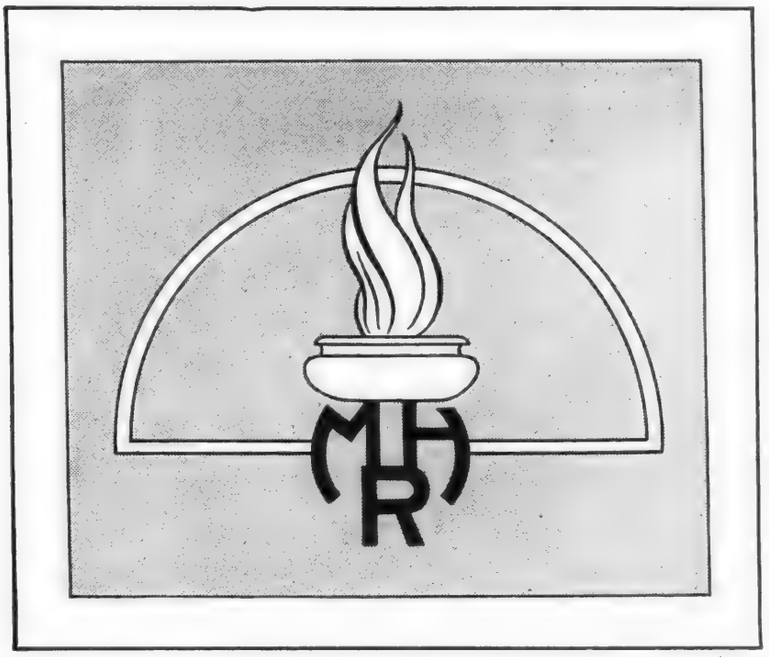
This automatic return valve discharges all water and air and retains every bit of steam. It is a remarkable fuel saver. The result of its silent service is that if there is an ounce of steam in your boiler you may have it at once in any room. Flexibility and economy—no shivery waits, no throwing open windows to cool off. And since this little bronze circulation manager is literally *made like an instrument*, its important service is as accurate after several years as in the first year. See and specify Barnes and Jones Better Built Vapor Valves.

Barnes & Jones

BETTER BUILT VAPOR VALVES

128 Brookside Ave., Jamaica Plain, Boston

126 East 44th St. New York City



UNSURPASSED ENGINEERING FACILITIES
for new applications of automatic control

Whatever developments may startle the heating world within the next few years, this organization is equipped to offer wholehearted cooperation in solving the attendant problems of control.

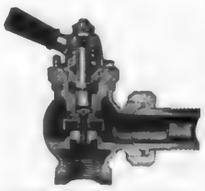
The Minneapolis-Honeywell organization includes the engineering personnel and facilities of the two original companies which successfully met the new situation arising from the sudden growth of oil and gas heating, and made it possible for burner manufacturers to obtain vitally important control equipment from the established makers of heat regulators. It brings together the factors responsible for practically every important improvement in automatic heat control up to the present time.

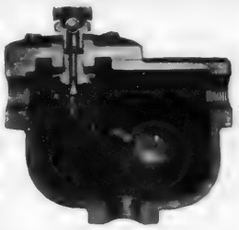
The engineering and experimental facilities of the new company enable equipment manufacturers to proceed confidently with their own plans for heating advancement—knowing that Minneapolis-Honeywell can keep step with progress.

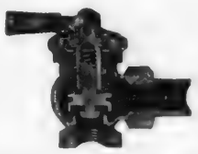
MINNEAPOLIS
REGULATOR COMPANY
HONEYWELL

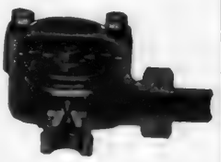
Executive Offices: Minneapolis *Factories:* Minneapolis and Wabash, Ind.

522 SYLPHON TRAP

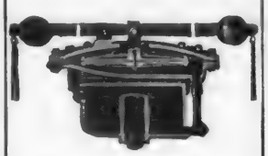

MODULATION VALVE


VENT TRAP

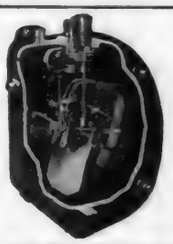

SYLPHON PACKLESS VALVE


SERIES "78" TRAP

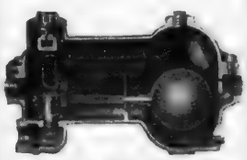
026 DRIP TRAP

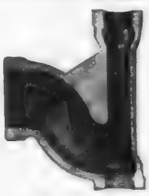

DAMPER REGULATOR

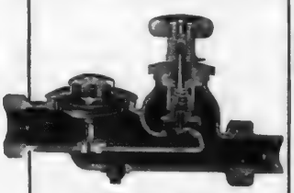
DIRT STRAINER


023 BOILER RETURN TRAP

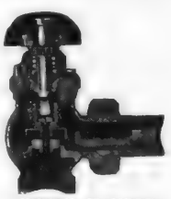
SERIES "78" DIRT STRAINER


HEAVY DUTY TRAP


¾" TO 2" LIFT FITTINGS, SCREWED CONNECTIONS

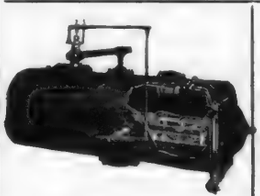

DOUBLE SERVICE VA...

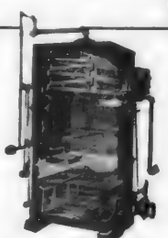
2½" TO 4" LIFT ...TTINGS, FLANGED ...NLET, SCREWED OUTLET


WHEEL HANDLE VALVE

EXPANSION JOINT

...LINDRICAL ...UGHT IRON ...HEATER


AIR SEPARATING TANK
Water Control


WROUGHT IRON RECTANGULAR FEED WATER HEATER

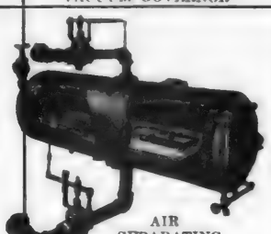
...T TRAP

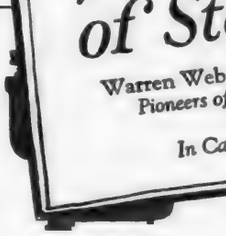
HORIZONTAL STEAM SEPARATOR

VACUUM GOVERNOR

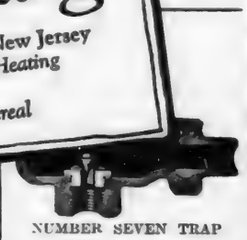
...TOR

SUCTION STRAINER


AIR SEPARATING TANK
Hydro-Pneumatic


323 VENT TRAP

223 BOILER RETURN TRAP


NUMBER SEVEN TRAP

THE outstanding characteristic of the "Webster Line" of heating system equipment is ability to continue rendering service year after year. Reliability is *in-built* as a cumulative result of forty years of invention, progress and experience during which correct application and use have consistently been placed ahead of the mere sale of apparatus.

Webster Equipment throughout each installation, plus Webster Service to the contractor, engineer, architect and owner, make Webster Systems safe investments.

Bulletin describing any item of the "Webster Line" will be sent on request.

- since 1888

Visit Booths 41-42
Chicago Power Show

Webster Systems of Steam Heating

Warren Webster & Company, Camden, New Jersey
Pioneers of the Vacuum System of Steam Heating
52 U. S. Branch Offices
In Canada, Darling Bros., Ltd., Montreal

Woolworth store at Olive and 8th St., St. Louis, Mo.

The Largest Buyers are the Wisest

GREAT retail corporations whose gigantic success has been built on wise buying use Heggie-Simplex steel boilers to insure the comfort of their customers. Trained ability to weigh every important factor in making a wise purchase has brought many of America's business leaders to this conclusion—that the most modern of heating boilers is the logical choice in modern buildings.

Heggie-Simplex Boiler Co., Joliet, Illinois. Representatives in principal cities —telephone and address listed under "Heggie-Simplex Boiler Company."

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL HEATING BOILERS

The Heating and Ventilating Magazine

VOL. XXV — Reg. U. S. Pat. Off. Reg. Canadian Pat. and Copr't Off. — No. 2

Contents of previous issues of THE HEATING AND VENTILATING MAGAZINE *can be found by consulting the Industrial Arts Index at the nearest library.*

Contents for February, 1928

Pressure Losses in Air Ducts..... *William D. Edwards* 69
Graphic Methods Applying to Square, Rectangular and Round Cross Sections.

Theater Air Conditioning in the Southwest..... *Everett S. Buck* 73

Simplification Needed in Radiator Manufacture..... *Harold L. Alt* 75
How a Multiplicity of Heights, Some Varying By Only One-Half Inch, Complicates Comparison and Selection.

Radiator Ratings on a B.T.U. Basis..... *A. H. Schroth* 78

New Home-Study Course in Gravity Steam and Water Heating.....
Ara Marcus Daniels 81
Lesson No. 30—Estimating Steam and Water Heating Jobs (Continued).

Public Building Ventilation With Automatic Roof Ventilators.....
George D. Beals 84
How Increasing Building Costs Are Directing Attention of Engineers and Architects to the Possibilities in This Connection.

American Society of Heating and Ventilating Engineers..... 87
Proceedings of the Thirty-Fourth Annual Convention.

Health and Ventilation..... *Peter H. Bryce, M.D.* 102
6. The Dust of the Outer Atmosphere in Relation to Health.

How Would You Do It?..... 104

New Government Tests on Glasses Transmitting Ultra-Violet Rays.. 106

Correspondence..... 107
Degree-Days and the Demand Factor in Heating.
". . . Of That Balminess Redolent of Spring."

American Oil Burner Association Incorporates..... 107

Selling Gas Service to the Architects..... 109

Huge Building Volume to Continue During 1928..... 110

General Magazines Take Up "Certified Heating"..... 111

American Society of Heating and Ventilating Engineers..... 112
Illinois Chapter Discusses Unit Heaters.
Illinois Chapter Told of Work of New York Commission on Ventilation.
New York Chapter Discusses Building Insulation.
Inspection of University of Minnesota Experimental Engineering Laboratories.
Chapter Notes.

Legal Decisions..... 114

Tribute to Edwin S. Hallett and the Ventilation of the St. Louis Schools 115

Heating and Piping Contractors National Association..... 116
Urges Separate Organizations of Heating and Plumbing Contractors.
Annual Meeting to Be Held in Philadelphia.
Directors Hold Winter Meeting.
Appointment of Edward G. Byrd as Field Man.
Plan of Training Workers Proposed by the Heating Contractors.

Heating and Ventilating Exhibitors at the Chicago Power Show.... 119

The Weather for December, 1927..... 120
New York, Boston, Pittsburgh, Chicago, St. Louis.

Monthly Heating Loads in Degree-Days in Five Typical Cities..... 122

Present Accepted Practice in Domestic Oil Burners..... 127
34. Penberthy

Standard Heating and Ventilating Data Sheets.....114A
No. 20-N and No. 20-O—Air Conditioning—Calculations for a Typical Theater (continued).

Engineers' Specification Index, Page 186.

Advertisers' Index, Page 194.

"Now You See It, Now You Don't"

IT'S poisonous substances in the air.
No, it's not; it's carbon dioxide.
No. it's not; it's diffusion.
No, it's not; it's "canned air."
No, it's not; it's ozone.
No, it's not; it's recirculation.
No, it's not; it's excessive temperature and humidity.
No, it's not; it's ultra-violet rays.
No, it's not; it's open windows.
No, it's not; it's "controlled ventilation."
No, it's not; it's "a mysterious influence."

That, at least brings us up to date. In the meantime, State laws continue in force, calling for 30 cu. ft. of fresh outdoor air per pupil per minute, for fresh-air inlets at the old 8-ft. level, while recirculation is taboo. It has well been said that no change should be made in the existing requirements until something better has been devised. It also could be said that if any change is made in the present compulsory ventilation laws, let it be done by those who sponsored the present laws and not by the opponents of controlled ventilation.

G. V. Armagnac

YEARLY SUBSCRIPTION $2.00 — **SINGLE COPIES, 30 CENTS**

Published monthly at 386 Fourth Avenue, New York, by The Heating and Ventilating Magazine Company.

Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

Copyright, 1928, by Heating and Ventilating Magazine Co.

The Progress of Heating and the Prevention of Heat Waste

Last of a Series

Necessity The Mother Of Invention

THE Johnson System of Heat Control was invented and given to the world forty-three years ago by Prof. W. S. Johnson, then on the teaching staff of Whitewater Normal School. ¶ He later established Johnson Service Company, now with thirty-two factory branches in United States, Canada, Europe and Asia. ¶ Necessity most truly was the mother of invention in this origin of automatic heat control. ¶ Observing as school teacher the ill effects and coal extravagance of over-heating his school's study and recitation rooms, Prof. Johnson experimented for many years toward a means of maintaining consistent and correct temperature conditions, and also minimum fuel consumption. ¶ The result, in short, was The Johnson System of Heat Control: perfected greatly today, after all its forty-three years; and installed in hundreds of buildings of all kinds everywhere — automatically and most reliably maintaining correct temperature, night and day, as required; and effecting fuel economy results amounting to as much as 40 per cent. ¶ And more of a necessity today than the day invented.

JOHNSON
SERVICE COMPANY
MILWAUKEE, WISCONSIN

Branches in all principal cities
of United States and Canada

The All Metal and Dual Thermostat (*Night and Day*) Control

The Johnson Dual Thermostat (Night and Day) System Of Temperature Control is the greatest advancement in heat regulation since Johnson's Pneumatic Thermostat invention in 1885. . . . . .

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

FEBRUARY, 1928

Pressure Losses in Air Ducts

Graphic Methods Applying to Square, Rectangular and Round Cross Sections

By William D. Edwards, M. E.

THE accompanying charts afford a graphic method of determining the pressure losses in air ducts having square, rectangular or round cross sections. The charts are identical, except that the scale is increased in one to facilitate more accurate use at the lower ranges.

The calculation of the charts is based upon the area of the friction surface of the duct in relation to the area of cross section and the velocity in same. The formula is

$$p = K \times \frac{S}{A} \times V^2$$

p = pressure loss in pounds per square foot.
S = square feet of rubbing surface of the duct.
A = area of cross section of duct in square feet.
V = velocity of air in feet per minute.
K = constant for galvanized iron (0.000,000,001,9).

Example: Assume 8400 C.F.M. at 1500 ft. velocity, length of duct 100 ft. and depth 12¼ in. By calculation, an area of 5.6 sq. ft., or 806.4 sq. in. is required, making the width of the duct 66 in., or a perimeter of 13 ft.; which, in the 100 ft. of length, gives a rubbing surface of 1300 sq. ft., or "S." This, divided by "A" or 5.6 sq. ft. gives a "mean hydraulic radius" of $\frac{S}{A}$, or 233. The equation then becomes

$p = 0.000,000,001,9 \times 233 \times (1500)^2$, or $p = 0.98075$ lbs.

The upper left-hand section of the chart shows the relation between the volume of air, velocity, and the required cross-sectional area of the duct. It also gives the dimensions of the duct for this area. To the right is the section showing the relation of the duct dimensions to the perimeter, which, combined with length of duct in the lower-hand section, gives the rubbing surface of the duct in square feet.

The section at the lower left gives the relation of the rubbing surface divided by the area $\left(\frac{S}{A}\right)$ or the "mean hydraulic radius." It also shows the relation of this mean hydraulic radius to the velocity, including the constant, giving the pressure-loss required in terms of pounds per square foot, ounces per square inch or inches of water per square inch.

In the use of the charts let us select the example figured above. We start with 8400 C.F.M. on Chart 1. The line through this point is projected to the right until it meets the 1500-ft. velocity line. At that point (A), the vertical line gives the area. Noting this for future use, the dimension of one side of the duct is selected on the vertical line at the right (B), this being 12¼ in. The line through this point, projected to the left and meeting the vertical line of area (C) gives the dimensions of the other side of the duct, or 66 in., as shown on the diagonal.

Starting at the point of 12¼ in. (B), and projecting the line to the right until it meets a vertical line (D), dropped from the point corresponding to the other duct dimension (in this case, 66 in.) this intersection, continued along the diagonal to the foot of the upper right-hand section of the chart (E), gives the perimeter 156 in., or 13 ft.

Continuing vertically downward to the intersection of the diagonal of the duct length (F) and then to the left, we find the surface of the duct (in this case, 1300 sq. ft.) at (G).

In the lower left-hand section of the chart, this

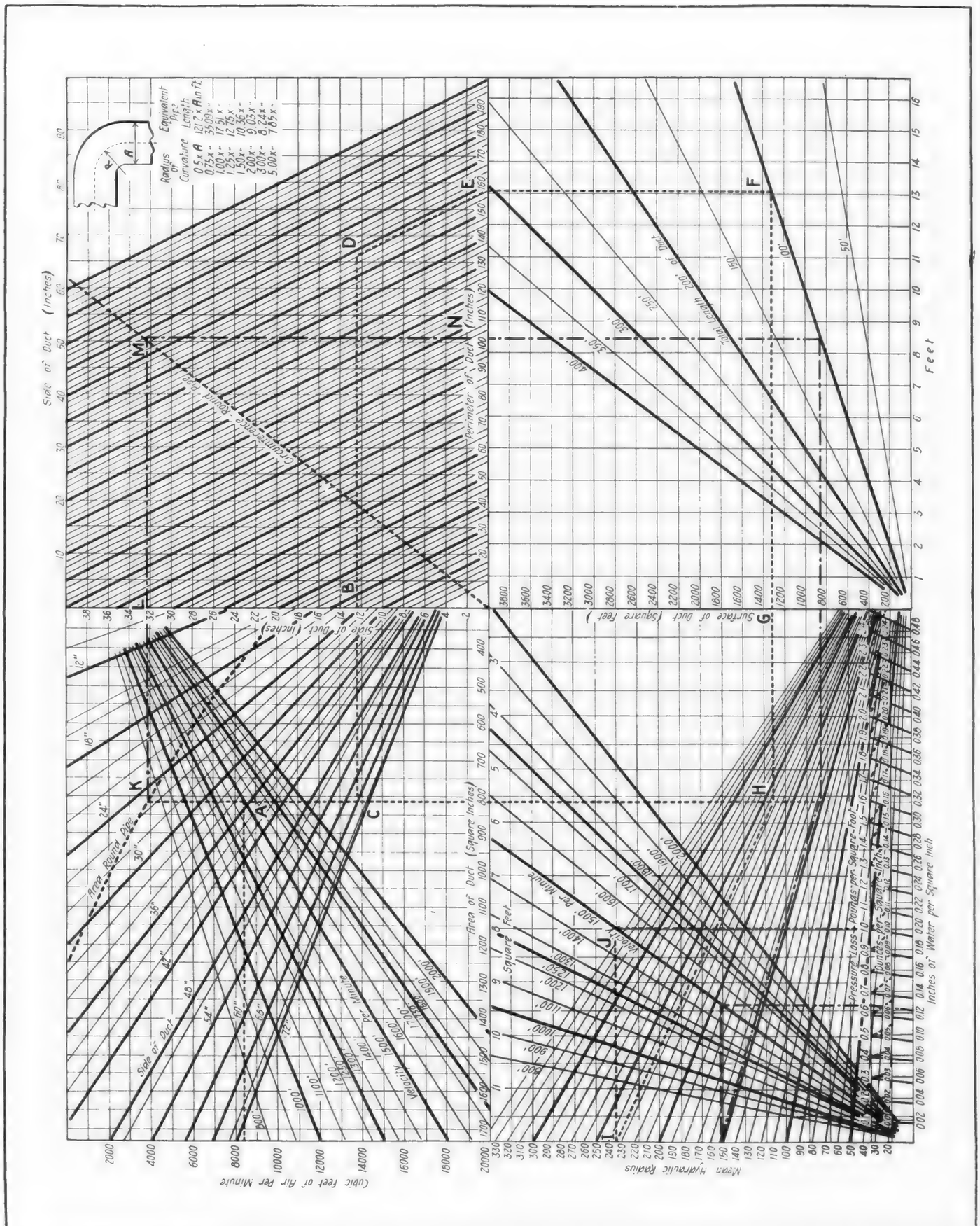


Chart I. Graph for Determining Air Pressure Losses in Ducts Having Square, Rectangular or Round Cross Sections

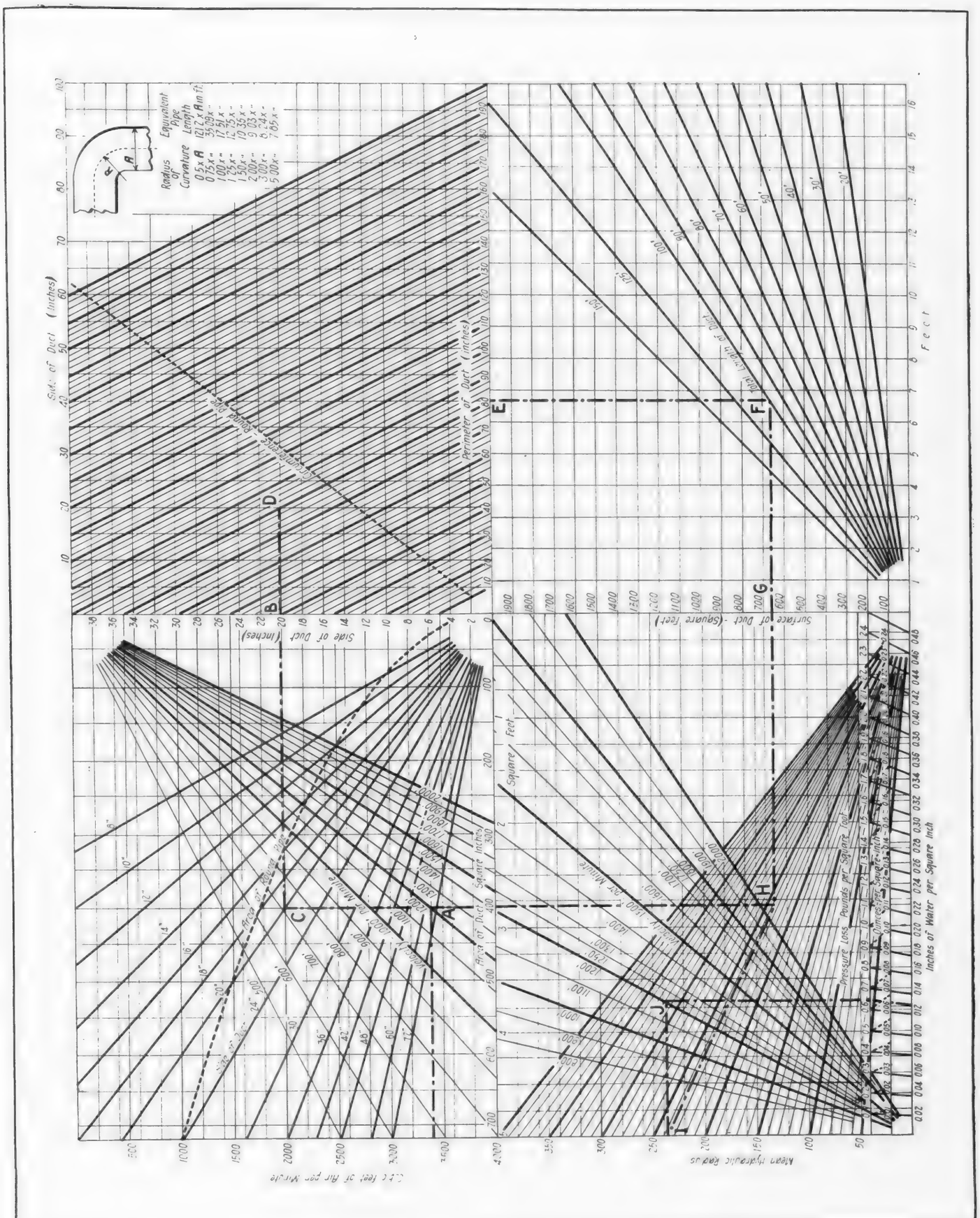


Chart 2. Graph for Determining Air Pressure Losses in Ducts Having Square, Rectangular or Round Cross Sections (This is the same as Chart 1 except that the scale is increased to make more accurate its use at the lower ranges)

area of 1300 sq. ft. is projected to the left until it meets a vertical line at (H) dropped through the point of the area of the duct, as found in the first operation (806.4 sq. in., or 5.6 sq. ft.). Continuing from this intersection to the left along the diagonal gives (at I) the mean hydraulic radius of 233. By projecting a line through this point to meet the diagonal of the given velocity (J), and then dropping to the bottom of the chart we find the pressure loss. In this case, with the 1500 ft. velocity, the loss is given as 1.0 lb. The figure corresponds closely with the estimated loss of 0.98075 lbs. per square foot.

Taking a smaller air supply and using Chart 2, let us assume that we will require 3400 C.F.M. at 1200 ft. velocity per minute, the length of duct to be 100 ft. and the depth 20 in. By calculation an area of 44.4 sq. ft., or 400 sq. in., is required, making the width of the duct 20 in., or a perimeter of 80 in., or 6½ ft. In the 100 ft. of length this gives a rubbing surface (S) of 650 sq. ft. This divided by A, or 44.4 sq. ft., gives a mean hydraulic radius of $\frac{S}{A}$, or 14.6. The equation then becomes:

$p = 0.000,000,001,9 \times 233 \times (1200)^2$, or $p = 0.63749$ lbs.

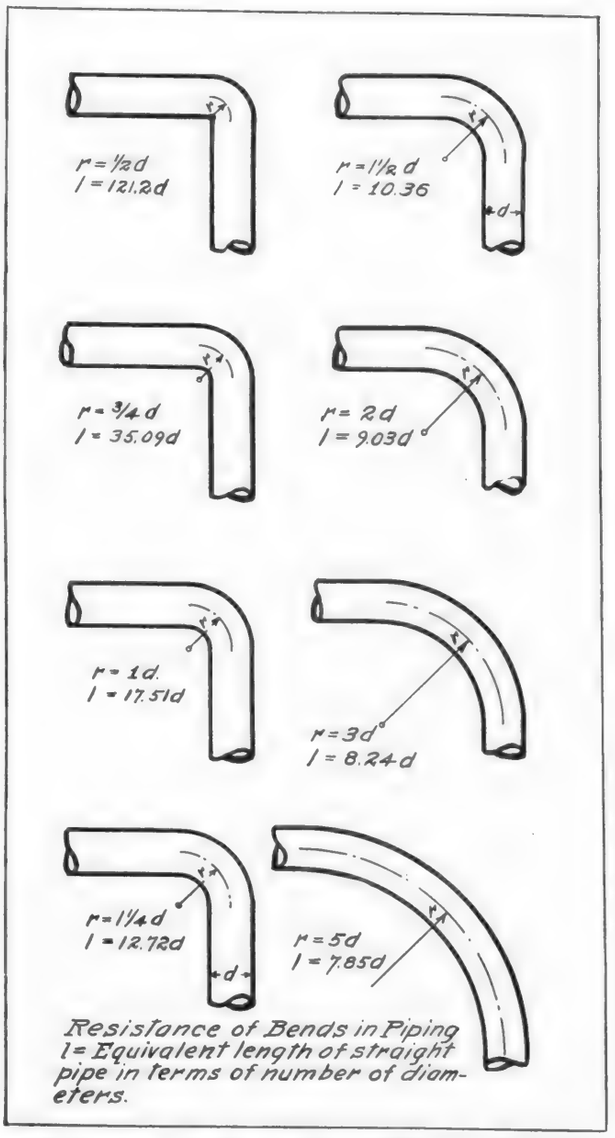
To solve by the chart, we start with 3400 C.F.M. The line through this point is projected to the right until it meets the 1200-ft. velocity line. At that point (A) the vertical line gives the area. Noting this for future use, we pass on to the scale (B), showing, on the vertical line, the dimension of one side of the duct, 20 in. The line through this point projected to the left and meeting the vertical line of area (C) gives the dimension of the other side of the duct or 20 in., as shown on the diagonal. Starting at the point of 20 in., (B), and projecting the line to the right until it meets a vertical line (D), drop from a point corresponding to the other duct dimension (in this case, 20 in.). This intersection continued along the diagonal line to the foot of the upper right-hand section of the chart (E) gives the perimeter 80 in., or 6½ ft.

Continuing vertically downward to the intersection diagonal of the duct length (F) and then to the left, we find the surface of the duct (in this case 660 sq. ft.) at (G).

In the lower left-hand section of the chart, this area of 660 sq. ft. is projected to the left until it meets a vertical line at (H), dropped through the point of the area of the duct, as found in the first operation, 400 sq. in., or 44.4 sq. ft. Continuing from the intersection to the left along the diagonal gives (at I) the mean hydraulic radius of 235. By projecting a line through this point to meet the diagonal of the given velocity (J) and then dropping to the bottom of the chart, we find the pressure loss, 0.64 lbs.

DETERMINING PRESSURE-LOSSES IN ROUND PIPE

In determining the pressure-losses in pipe having a circular cross section, the same method is followed for determining the required area of the duct. The line then is carried vertically until it intersects (at K) with the curve designated "Area of Round Pipe." From this intersection a horizontal line to the right (L) gives the pipe diameter. This line continued to the diagonal designated "Circumference-Round Pipe" (M) and then dropped vertically (instead of diagonally, as in the case of rectangular pipe) gives (at N) the pipe circumference. From that point the procedure is the same as that previously used to determine the pressure-loss in rectangular ducts.



Resistance to Air Flow in Round Pipes in Terms of Equivalent Length of Straight Pipe

To the actual length of straight duct must be added the equivalent length of duct caused by bends and elbows of varying radius of curvature. The total of the above is the length to be used in the chart calculations.

The relation of the pressure-losses in ducts other than galvanized-iron, upon which the charts are based, is as follows:

Galvanized-iron	1.00
Smooth plaster	1.25
Rough plaster	1.66
Rough brick	2.00

Theater Air Conditioning in the Southwest

By Everett S. Buck

IN a country where ten miles' difference in location may change completely the character of the mechanical equipment necessary to secure desired results, probably the most valuable item an engineer's office can possess is recent and detailed hourly weather records; recent, because the formation of a new irrigation district may give an entirely new set of humidity factors to consider.

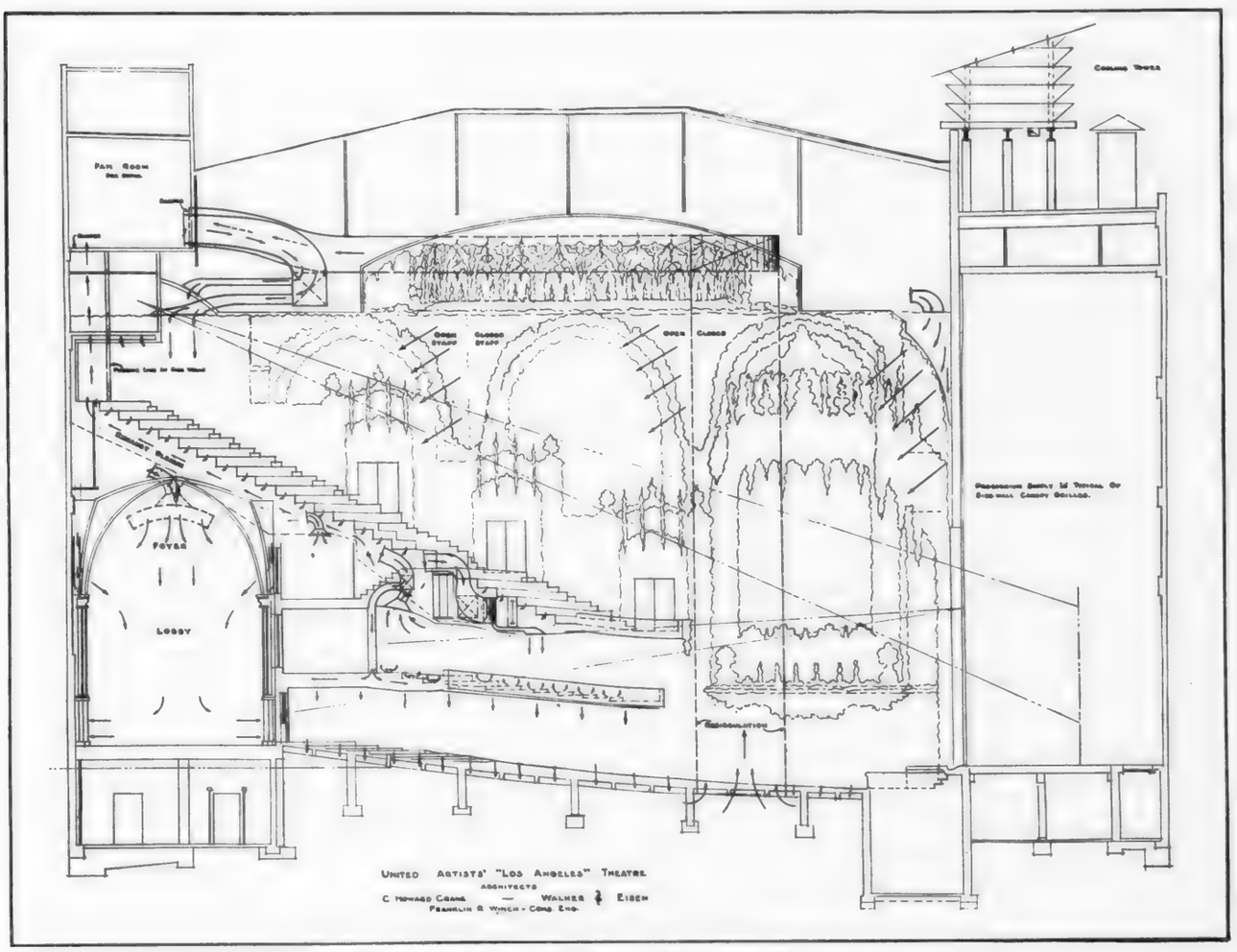
The government weather records, taken on top of the Central Building, in the heart of Los Angeles business district, are of little value in heating work if the building is to be located in Beverly Hills, eight miles nearer the Pacific Ocean and pleasantly affected by its cooling breezes.

Realizing that the records were inadequate, the Los Angeles Chamber of Commerce, some time ago, established its own weather bureau and is endeavoring to explain in terms intelligible to the layman, the combination of sunshine, high fog, humidity, air movement, temperature and ozone, which, taken together, makes up the charm of Los Angeles' climate.

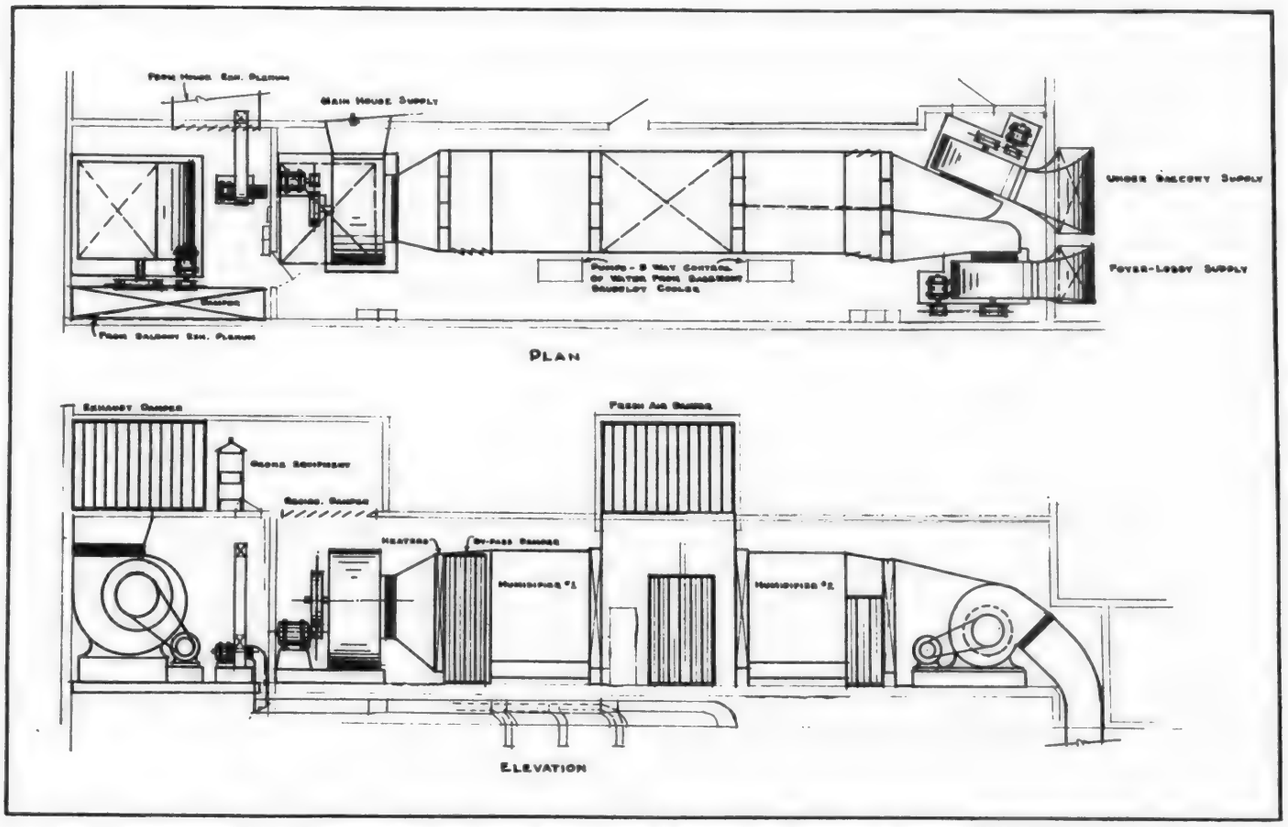
The head of this department, discovering temperatures of — 20° to 140° F. and usual humidities of 7% to 95%, all within a few miles of the city, has evolved the phrase "where climate is *a la carte*."

Two hours' easy motoring from Los Angeles brings you to San Bernardino, an oasis on the edge of the desert, where all available mean humidity and temperature records would lead one to suspect terrific heat. But you observe your unwilted collar in the presence of a dry-bulb reading of 110° F. and, unlimbering your psychrometer, you learn the true story of desert dryness. You learn too that "mean" does not mean much when applied to humidity records.

Here, you are in sight of, and but a few miles



Scheme for Heating and Ventilating United Artists' Los Angeles Theater



Layout of Fan Room for United Artists' Los Angeles Theater

from, perpetual snow, and it is a favorite sport to bring down a rear-seat full and enjoy snowballing in mid-summer.

RECENT PRACTICE IN LOS ANGELES THEATER VENTILATION

But to return to downtown Los Angeles. Until recently, because of ideal conditions which prevail during nine months of the year, it was the practice, in the equipment of theaters, to install one or two noisy exhaust fans and spot a few unvented gas radiators about. When the combination of garlic, Fleur de l'Orient, halitosis, etc., became unbearable, the organ and the big propeller fans would be started.

Some of these old propeller fans are quite the equal of the organ in noise-generating characteristics, but they move the air out, and down the aisles comes a flood of cool air, striking the defenseless patron on the back of his perspiring neck and legs. Naturally, we are behind in our hospital building program.

With the entry of the West Coast Theater Organization, which employed a forceful construction engineer who was a firm believer in plenty of properly-warmed air, things took a turn for the better. Incidentally, it is worth while to mention that in all of these theaters the air now is introduced through floor fixtures which prevent the air from striking the backs of the legs directly, so that comfort conditions in the better theaters are very good indeed.

During July, August and September, conditions are intolerable in most Los Angeles theaters, but we have two houses—the Orpheum and the Metropolitan—that have adequate refrigerating systems, and as an index of the prevailing trend, three more are in course of construction.

DESIGN OF EQUIPMENT FOR THE LOS ANGELES THEATER

We have tried to profit by past attempts, and, in the design of the new United Artists Theater, the "Los Angeles," which is here shown diagrammatically, were very nearly able to approximate our ideals. Not the least of these is economy of operation, which was considered second only to satisfactory comfort conditions.

The greatest return in proportion to the equipment involved is gained by recirculation of a maximum of 75% of the air which is purified and deodorized by ozone treatment and mixed with air of automatically-controlled wet- and dry-bulb temperatures.

For all practical purposes, the moisture content of the returning air will be constant, assuming a correct original send-out and normal attendance. The wet-bulb will vary slightly, however, the variation being dependent on building heat loss, length and insulation quality of the recirculating ducts. Maximum recirculation will occur with both external maximum and minimum temperatures.

Refrigeration for this house was designed for 2500 persons and an external temperature of 95° F. dry-, 71° F. wet-bulb. Structural conditions and a high square-foot valuation of the property which

(*Continued on Page* 80)

Simplification Needed in Radiator Manufacture

How a Multiplicity of Heights, Some Varying By Only One-Half Inch, Complicates Comparison and Selection

By Harold L. Alt

SINCE this article was written new ratings have been announced by a majority of the radiator manufacturers and are incorporated in the accompanying tables. In general, it may be said that these ratings, although expressed in square feet of surface, are based on the total heat emitted in B.T.U., divided by 240 B.T.U.

WITH all the effort and expense incurred in the last few years to standardize and rationalize the products of the country, it is a singular fact that the radiator situation actually has retrogressed. The purpose of this article is to point out just how the present radiator situation has been complicated, and to offer suggestions as to how this difficulty may be remedied —if it is possible to remedy it at all.

Most of the readers of this article will admit without argument that the old plain-type radiation was fairly standard as far as heights, widths and surfaces were concerned; fair and equal competition could be secured in almost every installation, and there was little to recommend one make of radiation over that of any other. Moreover, designs of systems could be laid out with the assurance that, whatever make of radiation might be selected, it would fit in the allotted space. Plans could be made, enclosures figured, grilles for concealed radiators sized, and the whole job could be designed on a reasonable and rational basis.

Now there has been present in all lines of industry an effort to do away with the special, the unusual, the bizarre, and the unique; this is not due necessarily to any desire to stifle new designs, or to throttle initiative, but unstandardized products have been proved to be costly and uneconomical to produce, difficult to handle, and of questionable desirability as to results. This has clearly been shown in the elimination of pipe sizes, fittings and valves of the odd sizes, such as 4½-in., 7-in., and 9-in., which formerly were manufactured and sometimes carried in stock.

NUMEROUS MANUFACTURERS NOW PRODUCING TUBULAR TYPES

When tubular radiation was first placed on the market there was only a single manufacturer making it and it was a "special" type which had no substitute. Therefore, its size, surface and dimensions were not of great moment because anyone desiring to use this particular type laid out his job accordingly. In the course of time—as might be expected—other manufacturers found it necessary to meet the demand for the tubular type of radiation and they began to produce such radiators. That is to say, the radiators were of *similar*, but not of the *same* construction. The surface per section varied, the widths varied, and the heights varied in some cases and not in others.

Other manufacturers entered the field with new ideas which doubtless they considered as improvements on the original design. To-day there are at least nine manufacturers actually producing and marketing such radiation, with at least one more about to enter the field. There may be others, but the fact that there are this many is sufficient to indicate the difficulties into which the industry is drifting.

3-TUBE RADIATION

Make of Radiator	Heights Manufactured by Various Makers 20" 22" 23" 26" 27" 30" 31" 32" 34" 36" 38" Ratings in Square Feet per Section										
Type "A"	1.75	none	none	2.33	none	none	none	3.00	none	none	3.50
Type "B"	1.75	none	2.00	2.33	none	3.00	none	none	none	3.50	none
Type "C"	1.75	none	none	2.33	none	3.00	none	none	none	3.50	none
Type "D"	1.75	none	none	2.33	none	none	none	3.00	none	none	3.50
Type "E"	1.75	none	none	none	2.66	none	3.00	none	none	none	3.66
Type "F"	1.75	none	2.00	2.33	none	3.00	none	none	none	3.50	none
Type "G"	1.75	none	none	2.67	none	3.00	none	none	none	3.67	none
Type "H"	1.75	none	none	2.33	none	none	none	3.00	none	none	3.50
Type "I"	none	2.00	none	2.75	none	none	3.25	none	3.67	none	none
Type "J"		In Process of Development									

Fig. 1. Comparison of Heights and Surfaces on Three-Tube Radiators (*Revised ratings not received in time for insertion)

4-TUBE RADIATION								
Make of Radiator	Heights Manufactured 20" 23" 26" 30" 32" 36" 37" 38" Ratings in Sq. Ft. per Section							
Type "A"	2.25	none	2.75	none	3.50	none	none	4.25
Type "B"	2.25	2.50	2.75	none	3.50	none	4.25	none
Type "C"	2.25	none	2.75	3.50	none	4.25	none	none
Type "D"	2.25	none	2.75	none	3.50	none	none	4.25
Type "E"	none	none	none	none	none	none	none	none
Type "F"	2.25	2.50	2.75	3.50	none	4.25	none	none
* Type "G"	none	none	none	none	none	none	none	none
Type "H"	2.25	2.50	2.75	none	3.50	none	none	4.25
Type "I"	none	none	none	none	none	none	none	none
Type "J"	In Process of Development							

Fig. 2. Comparison of Heights and Surfaces on Four-Tube Radiators (*Revised ratings not received in time for Insertion)

COMPARISON OF EXISTING TUBULAR TYPES

For the benefit of the reader, I have prepared lists of the more popular types of tubular radiation, showing the sizes, dimensions and the newly-announced ratings of the types now sold by the larger manufacturers or contemplated in the very near future. The various makes are designated as "Type A," "Type B," etc., and each type so termed indicates the product of some manufacturer, the same manufacturer's product being classified as the same type throughout.

The radiators selected are as follows:—

Type "A"—Corto, American Radiator Company.
Type "B"—Capitol, U. S. Radiator Corporation.
Type "C"—Aero, National Radiator Corporation.
Type "D"—Eastwood, Pierce, Butler and Pierce Mfg. Corporation.
Type "E"—Fero, Burnham Boiler Corporation.
Type "F"—Lansdale, Central Radiator Company.
Type "G"—Oriole, Republic Boiler and Radiator Company. (Revised ratings on these radiators have not been received. Consequently ratings in tables are those in effect previous to January 1, 1928).
Type "H"—Copley, Gurney Heater Mfg. Company.
Type "I"—Union Art, Union Radiator Company.
Type "J"—Being developed by the H. B. Smith Company.

THE THREE-TUBE RADIATOR

In Fig. 1 is given a comparative listing of all the three-tube radiation made by the above-mentioned manufacturers, with the exception of the last, on which information shows some very surprising facts. For instance, it will be noted that *in no height of radiation is it possible to secure competitive bids from all of the makers listed.* It would help immensely if the manufacturers could even agree on the popularity of some height of radiation to which all might conform.

According to the tabulation, 20-in. radiation is made by seven companies, 22-in. by only one, 23-in. by only two, 26-in. by eight, 27-in. by only one, 30-in. by four, 31-in. by only two, 34-in. by only one, 36-in. by only four, and 38-in. (the old standard height) by only four.

FOUR-TUBE TYPES

Turning to Fig. 2, in which 4-tube radiation similarly is scheduled, it will be noted that the 20-in.

5-TUBE RADIATION													
Make of Radiator	Heights Manufactured 17" 20" 22" 23" 26" 27" 30" 31" 32" 34" 36" 37" 38" Ratings in Square Feet per Section												
Type "A"	none	2.67	none	none	3.50	none	none	none	4.33	none	none	none	5.00
Type "B"	none	2.67	none	3.00	3.50	none	none	none	4.33	none	none	5.00	none
Type "C"	none	2.67	none	none	3.50	none	4.33	none	none	none	5.00	none	none
Type "D"	none	2.67	3.00	none	3.50	none	none	none	4.33	none	none	none	5.00
Type "E"	none	3.00	none	none	3.75	none	none	4.00	none	none	none	none	5.00
Type "F"	none	2.67	none	3.00	3.50	none	4.33	none	none	none	5.00	none	none
* Type "G"	none	3.00	none	none	3.75	none	4.00	none	none	none	5.00	none	none
Type "H"	none	2.67	3.00	none	3.50	none	none	none	4.33	none	none	none	5.00
Type "I"	none	none	3.00	none	3.75	none	none	4.50	none	none	5.00	none	none
Type "J"	In Process of Development												

Fig. 3. Comparison of Heights and Surfaces on Five-Tube Radiators (*Revised ratings not received in time for insertion)

6-TUBE RADIATION

Make of Radiator	Heights Manufactured 20" 23" 26" 32" 37" 38" Ratings in Sq. Ft. per Sect.					
Type "A"	3.00	none	4.00	5.00	none	6.00
Type "B"	3.00	3.50	4.00	5.00	6.00	none
Type "C"	none	none	none	none	none	none
Type "D"	none	none	none	none	none	none
Type "E"	none	none	none	none	none	none
Type "F"	none	none	none	none	none	none
* Type "G"	none	none	none	none	none	none
Type "H"	3.00	none	4.00	5.00	none	6.00
Type "I"	none	none	none	none	none	none
Type "J"	In Process of Development					

Fig. 4. Comparison of Heights and Surfaces on Six-Tube Radiators (*Revised ratings not received in time for insertion)

height is made by seven companies, the 23-in. by three, the 26-in. by seven, the 30-in. by only two, the 32-in. by four, the 36-in. by only two, the 37-in. by only one, and the 38-in. by only three.

FIVE-TUBE RADIATION

In five-tube radiation the field simply has gone mad, for there are no less than 13 different heights of radiation being turned out in this style by the various makers. The situation is illustrated in Fig. 3, and it will be seen that in spite of this profuseness in design it is still possible to find eight companies making the 20-in. height and a similar number making the 26-in. height. Outside of these the other heights are widely scattered, with no preferences discernible, except in the 32-in. height, which is being produced by four companies.

ALL-TUBULAR RADIATION

Make of Radiator	Number of Tubes 3 4 5 6 7 Section Width					3 4 5 6 7 Section Width				
Type "A"	4 5/8"	6 5/16"	8"	9 11/16"	11 3/8"	2 1/2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"
Type "B"	4 15/16"	6 3/8"	8 9/16"	10 3/8"	12 3/16"	2 1/2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"
Type "C"	5 1/8"	6 13/16"	8 13/32"		12"	2 1/2"	2 1/2"	2 1/2"		2 1/2"
Type "D"	5 1/8"	7"	8 3/8"		12 5/8"	2 1/2"	2 1/2"	2 1/2"		3"
Type "E"	5 1/8"		8 9/16"		12"	2 1/2"		2 1/2"		2 1/2"
Type "F"	5"	6 5/8"	8 5/8"		12"	2 1/2"	2 1/2"	2 1/2"		2 1/2"
Type "G"	5 1/8"		8 7/16"		12"	2 1/2"		2 1/2"		2 1/2"
Type "H"	5"	6 7/8"	8 3/4"	10 5/8"		2 1/2"	2 1/2"	2 1/2"	2 1/2"	
Type "I"	5 1/8"		8 3/8"		12 1/8"	2 1/2"	2 1/2"	2 1/2"		3"
Type "J"	Unknown					Unknown				

Fig. 6. Comparison of Lengths of Sections on All-Tubular Radiators

SIX-TUBE RADIATION

Six-tube radiation does not seem to be at all popular; only three manufacturers make it at all and two of them make it in only four heights, while the third turns it out in five heights. This is shown graphically in Fig. 4, in which the 20-in., 26-in. and 32-in. heights are found to be the most preferred sizes.

SEVEN-TUBE RADIATION

The height of specialization is reached in the seven-tube design, of which no less than 16 *different heights are being turned out.* There certainly is

(Continued on Page 80)

7-TUBE RADIATION

Make of Radiator	Heights Manufactured by Various Makers 13" 13 1/2" 14" 15" 16 1/2" 17" 19 1/2" 20" 21" 22" 23" 26" 30" 32" 36" 38" Ratings in Square Feet per Section															
Type "A"	none	none	2.50	none	none	3.00	none	3.67	none	none	none	none	none	none	none	none
Type "B"	2.75	none	none	none	3.50	none	none	4.25	none	none	none	none	none	none	none	none
Type "C"	none	2.67	none	none	3.00	none	none	3.67	none	none	none	4.75	5.50	none	6.75	none
Type "D"	none	none	2.50	none	none	3.00	none	none	none	4.00	none	5.00	none	6.25	none	7.50
Type "E"	none	3.25	none	none	3.75	none	none	4.50	none	none	none	5.25	6.33	none	7.00	none
Type "F"	none	2.50	none	none	3.00	none	none	3.67	none	none	4.25	5.00	6.00	none	7.00	none
* Type "G"	none	3.25	none	none	3.75	none	none	4.50	none	none	none	5.25	6.33	none	7.00	none
Type "H"	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none	none
Type "I"	none	none	none	4.00	4.00	none	5.00	none	5.00	none	none	6.00	none	7.00	none	8.00
Type "J"	none	none	In Process of Development													

Fig. 5. Comparison of Heights and Surfaces on Seven-Tube Radiators (*Revised ratings not received in time for insertion)

Radiator Ratings on a B. T. U. Basis

By A. H. Schroth
Vice-President and General Manager, Richmond Radiator Company.

WITH the establishment of boiler performance tables as determined by actual tests, it has been felt that equally dependable ratings should be established for radiators, so that the purchaser would know what he was buying in terms of heating capacity, as well as square feet of direct radiation. Accordingly, one radiator manufacturer retained the Frost Research Laboratory, of Norristown, Pa.—an engineering research organization having no commercial interest in products submitted to it for tests—and instructed them to determine by condensation tests conducted according to the code of the A.S.H. & V.E. for testing direct radiators, the capacity in B.T.U. and the equivalent square feet of direct radiation of the company's various types and sizes of radiators, so that there might be secured readily understandable performance tables giving at a glance the *real heating value* of the company's radiators of certain sizes.

NO ACCOUNT TAKEN OF VARYING EFFICIENCY

The ideal radiator, from an efficiency standpoint, would be of one section only and the further we depart from this maximum the greater the drop in comparative efficiency. For example, an 8-section radiator and a 30-section radiator have but two end sections each, while the former has only six intermediate sections and the latter twenty-eight. Therefore, if six intermediate sections and two end sections of the 8-section radiator develop 40 sq. ft. equivalent of direct radiation, or 5 sq. ft. per section, it follows that twenty-eight intermediate sections, plus two end sections, do not develop 5 sq. ft. per section, or 150 sq. ft.

This is directly confirmed by the performance table here given. Reference to this table will show that if we applied the average of 40-sq. ft. radiator rating, the unit for this is a 7-section radiator having 5.81 sq. ft. per section. On that basis, a 30-section radiator would be rated at 174.3 sq. ft., whereas it has only 162.37 sq. ft., and, as explained a little further along, is really sold on a basis of 150 sq. ft. This only goes to show that the so-called average 40-sq. ft. radiator rating is an arbitrary measure.

RATINGS HAD NO RELATION TO EFFICIENCY

Long before the tubular-type radiators were placed on the market, extensive tests made by the American Society of Heating and Ventilating Engineers, the United States Bureau of Mines, and the Heating and Piping Contractors National Association, established the fact that the average 26-in., 2-col. radiator is 10% more efficient than the 38-in., 3-col. Regardless of this, ratings have been continued on the basis of square feet of surface. (See Chapter 2, pages 57-62, A.S.H. & V.E. 1928 *Guide*, for efficiencies of various heights of column radiators.)

Upon completing a line of tubular-type radiators, the Richmond Radiator Company determined to get away once and for all from the old arbitrary catalog rating and accordingly had the ratings of all of its sizes of radiators determined by the condensation test conducted according to the A.S.H. & V.E. code for testing direct radiators. The results of these tests are embodied in the following table and henceforth the company will publish its radiator ratings in this form.

FORM OF RADIATOR RATING TABLE BASED ON HEAT EMISSION, AS INDICATED BY TESTS

For 5-tube, 38-in. (Like tables for all heights 3-, 5-, 7-tube) 1 lb. steam pressure. Still air 70° F. at breathing line. (5 ft. above floor).

No. of Sections	Catalog Rating per Radiator Sq. Ft.	Guaranteed Rating per Radiator Equiv. Surface @ 240 B.T.U. per Sq. Ft.	B.T.U. per Radiator
1	5	8.93	2145
2	10	14.22	3415
3	15	19.51	4685
4	20	24.80	5955
5	25	30.09	7225
6	30	35.38	8495
7	35	40.68	9765
8	40	45.97	11035
9	45	51.26	12305
10	50	56.50	13575
11	55	61.84	14845
12	60	67.13	16115
13	65	72.42	17385
14	70	77.71	18655
15	75	83.00	19925
16	80	88.29	21195
17	85	93.59	22465
18	90	98.88	23735
19	95	104.17	25005
20	100	109.46	26275
21	105	114.75	27545
22	110	120.04	28815
23	115	125.33	30085
24	120	130.62	31355
25	125	135.91	32625
26	130	141.20	33895
27	135	146.50	35165
28	140	151.79	36435
29	145	157.08	37705
30	150	162.37	38975
31	155	167.66	40244
32	160	172.95	41540

ANALYSIS

	Square Feet per Section
One end section	8.93
2-section radiator	7.11
10-section radiator	5.65
20-section radiator	5.47
30-section radiator	5.41
Nearest to 40 sq. ft. radiator	5.81
Middle section	5.29
Actual heating surface	5.12
Catalog rating	5.00

Immediately following the column of the number of sections, are old catalog ratings for each size. These are important in this connection because selling prices are based on these catalog ratings, even if radiators thus sold actually have the same or more heating value than is represented by the catalog rating itself.

In the next column are given the equivalent surface ratings based upon the actual emission of 240 B.T.U. per square foot, while in the last column are given the total B.T.U. figures for each size radiator.

As mentioned at the head of the table, the guaranteed rating figures have been determined by condensation tests taken with steam at 1 lb. pressure, with the radiators standing in still air and a temperature of 70° F. at the breathing line, or 5 ft. above the floor, in accordance with the A.S.H. & V.E. code for testing direct radiators.

TESTS REVEAL MANY DISCREPANCIES

A comparison of the catalog ratings with those determined by actual test, as shown in the parallel columns, reveals the very important bearing due to the variation in efficiency which the number of sections has on the actual guaranteed rating. For instance, a 2-section radiator, commonly rated in catalogs as having 10 sq. ft. of direct radiation, is shown to have an actual heating surface value of 14.22 sq. ft., or 42% greater capacity than the old catalog rating.

Similarly, a 10-section radiator does not have a value five times as great as a 2-section radiator, which, in this case, would be five times 14.22, or 71.20 sq. ft., but actually has 56.50 sq. ft., showing the decrease in efficiency of the sections as the radiator is lengthened. This actual capacity of 56.50 sq. ft., however, is 13% greater than the old catalog rating of 50 sq. ft.

Another fact revealed by the table in connection with the decreasing efficiency of the sections is that as the radiators grow longer, the old catalog ratings become more nearly correct. For example, a 20-section radiator, commonly rated in catalogs as having 100 sq. ft., shows an actual value of 109.46, or only 9% greater capacity than the old rating, while a 30-section radiator has 162.37 sq. ft., as compared with the old 150 sq. ft. rating, or a difference of only 8%.

Basing the comparison on the examples cited above, it will be noted that a 7-section, or the nearest size to a 40 sq. ft. radiator, has 5.81 sq. ft. per section, while the nearest to 100 sq. ft. has 5.47 sq. ft. per section, and the nearest to 150 sq. ft. has 5.41 sq. ft., or considerably above the catalog rating of 5 sq. ft. per section in every case, while the buyer is paying on the basis of catalog ratings.

Referring to the values given at the bottom of the table, it will be noted that an intermediate section has an equivalent surface of but 5.29 sq. ft., while the one end section, as shown by the table, has 8.93 sq. ft., so that it is obvious that the end surface of any radiator has a greater equivalent value than the intermediate surface. Thus the equivalent surface value of a radiator of any number of sections is equal to that of one end section, plus that of the number of intermediate sections plus one.

For example, if a Richmond 38-in. 7-tube radiator were rated in actual square feet of heating surface, it would have a rating of 7.5 sq. ft., whereas under the code tests, its equivalent surface at 240 B.T.U. emission per square foot shows but 7.01 sq. ft. for intermediate sections. Therefore, this radiator is rated at but 7 sq. ft. per section.

EXAMPLES OF TYPICAL INSTALLATIONS

The following typical example illustrates the value of heating contractors and architects of having data available giving the actual performance value of radiators.

In this particular installation, a living room and a dining room each require 38,400 B.T.U., or 160 sq. ft. of equivalent direct radiation, 38-in., 5-tube radiators being specified. The living room has floor space for four radiators, while the dining room has space for one long radiator only. Based upon the old catalog ratings, there would be specified for this job one 32-section radiator for the dining room and four 8-section radiators for the living room, the radiators for each room, therefore, having a rating of 160 sq. ft. on the old basis.

As shown by the B.T.U. ratings in the table, the contractor, if these radiators were used, would actually be installing in the dining room 172.95 sq. ft. of radiation and, in the living room, 183.88 sq. ft., or a total of 356.83 sq. ft. of radiation, whereas only 320 sq. ft. are required, so that the contractor would be actually installing considerably more radiation than is really necessary to make a satisfactory job. (Installing 64-sec. or 320 sq. ft. catalog rating, contractor would pay at, say, 30c per square foot, net $96, although receiving 356 sq. ft.)

If the contractor made his selection on the B.T.U. basis given in the table, he would install one 30-section radiator in the dining room and four 7-section radiators in the living room, the former having an equivalent surface of 162.37 sq. ft. and the latter of 162.72 sq. ft., or a total of 325.09 sq. ft., representing a difference in the cost of the radiation that would often be more than sufficient to win or lose the contract. (Installing 58-section 290 sq. ft. catalog rating, contractor would pay at 30c per square foot, net $87, although receiving 325 sq. ft.)

Let us assume that the contractor is not familiar with the actual B.T.U. value of radiators of various types and sizes and has selected radiators by the catalog ratings, installing one 32-section in the dining room and four 8-section radiators in the living room, each room having radiators of an equivalent catalog rating of 160 sq. ft., in the belief that the rooms would be uniformly heated. As the tests show that four smaller radiators have a substantially greater B.T.U. emitting capacity than one large radiator of the same equivalent surface, the

living room will be about 6% warmer, or 5°, than the dining room under the same conditions of steam supply.

There is every reason to believe that this basis of rating radiators will have a far-reaching effect, since it places the selection of heating equipment upon a scientific basis. It will mean a decided saving in first cost on installations, more uniform results and a better knowledge of what we are doing in specifying certain equipment.

Tubular Radiation and Its Effect on Heating Design

(*Continued from Page 77*)

no necessity for such lavishness, as is indicated in Fig. 5, in which all of these heights are listed. Those most commonly encountered, as indicated by the number of makers, are the 16½-in. and 20-in. heights, produced by six makers in each instance, but, unfortunately, not the same six.

WIDTHS AND LENGTHS OF SECTIONS

In Fig. 6 all of the radiators listed on previous schedules have been tabulated to show the comparative widths and lengths of the radiator sections. It is found that the three-tube patterns have a minimum of 4⅝-in. width and a maximum of 5⅛-in. width; four-tube fluctuate between 6-5/16 in. and 7 in.; five-tube, from 8 in. to 8⅞ in.; six-tube, from 9-11/16 in. to 10⅝ in.; and seven-tube, from 11⅜ in. to 12⅝ in. In the matter of lengths the greatest uniformity of all is found, for all tubular radiators are made with sections 2½ in. long, except in two cases.

CONCLUSIONS

Now where does all this comparison lead, and just what does it show? In the first place, every one will agree that the situation in the tubular radiation field has no parallel anywhere where standardization and economy of production are considered. It certainly is an extremely difficult proposition to design any installation under present conditions and at the same time give all manufacturers an equal opportunity to estimate. The proposition from the contractor's standpoint is nearly as bad, for it is likely to work out into split jobs where one manufacturer supplies his product where it fits without difficulty, and another manufacturer furnishes some radiators which, in a few instances (by their very peculiarities), may suit the installation better than standard sizes—if there were any such thing as standard sizes.

Now this might seem to be an advantage, and as long as freak heights persist it would be; but if standard sizes were adopted and manufactured exclusively, everyone would know beforehand just what would be necessary and would make provision accordingly.

Theater Air Conditioning in the Southwest

(*Continued from Page 74*)

is on Broadway, in the path of greatest development, dictated the fan-room location.

Careful planning of the air-distributing system to secure good air movement assured us a comfortable house at 75° F., 55% R.H., and the net calculation was 140 tons of refrigeration. It is interesting to note that without considering this factor, and without ozone-treated recirculated air, the net calculation, based on the minimum of air handled, was in excess of 240 tons—a saving of over 100 tons—with anticipation of better air conditions in every respect.

In the writer's opinion, recirculation without ozone treatment should not be permitted. Mechanical difficulties are no longer a bar, and the benefits are well known. One of the United Artists Theater designers used ozonators 20 years ago for the auditoriums at the University of Hamburg.

A commonly-neglected factor is the rate of air motion, and it is highly important. In this 2200-seat house we have a normal air supply for all purposes of 102,000 C.F.M. Since varying-speed drives are an essential, in any event, for complete comfort, combined with economy, we found that we could design to increase our air to the house proper by approximately one third at a trifling added cost.

The value of this feature becomes more apparent when one notes the many summer days of 75° F. average afternoon temperature. A study of a local house which had an unprecedented air delivery disclosed the fact that the comfort point, with maximum air delivery, coincided with the temperature of the washed air leaving the re-heaters at 82° F., 40% R.H., when the external temperature was from 65° to 70° F.

We have provided, we believe, one of the finest systems of temperature control possible to obtain, but, because of the effect of the rate of air motion, we do not anticipate results regardless of brains, or at least a modicum of horse sense on the part of the operator.

The simplest way to be sure of continued comfort conditions is personally to investigate, and by tests, construct a chart for the operator, showing running points for winter and summer conditions, with instructions as to the other variables, such as complete recirculation for warming up and cooling, washer operations, etc.

The writer even has found it necessary, in some cases, to mark running points directly on the controls, for many managements cannot afford to pay the wages necessary to keep specially-trained operators, and it is our policy in designing to assume that all equipment must be so located and controlled as to be obvious as to function, and fool-proof as to operation.

This is the thirtieth lesson of
The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 30—Estimating Steam and Water Heating Jobs* (Continued)

By Ara Marcus Daniels

THE heating contractor also must paint basement pipes, for which a different charge must be applied. Or, he may have other surfaces to paint, such as cloth covering, asbestos or other materials, each of which must be properly estimated. The unit of 100 lin. ft. for pipe, or square feet of surface for other material, offers suitable units for establishing cost factors, in which material quantities should be given in detail. The more detailed information given on the card, such as quarts of paint per unit of work, cost per quart, time per unit of work and labor cost, the better for the estimator. The accuracy of the estimate is increased and there is afforded a means for checking up on supply bills.

CEILING AND FLOOR PLATES

There should be a charge for installation of ceiling and floor plates. It is not advisable to consider making any distinction in labor installation charge for different sized plates, or to differentiate between placing floor and ceiling plates. Different types of plates may be listed on the cost card, and, if the contractor so chooses, it may show such difference in cost of installation as actual average construction costs may determine.

WORK SHEETS AND ESTIMATE FORM

All high-class heating contractors use some form of work sheet and estimate blank for preparing their estimates, and all others should do so if they expect to conduct a profitable business.

Many forms or types of sheets are in use. They differ as best may suit the system of estimating employed. The use of such sheets is by no means superfluous work, but rather a necessity which pays in many ways. Behind the development or purchase of work sheets and estimate forms should be the idea of quickly and accurately recording the complete story.

It is best that the work sheet and estimate form be interdependent and thus eliminate, so far as possible, duplication of work. Where items, such as the boiler and radiators, may be taken directly from the plans and entered on the estimate blank in final form, such may not appear on the work sheet.

A work sheet should be so arranged as to permit tabulation that can easily and quickly be made, read and summarized. Work sheets can be used to tell more than the material and labor required. By the adoption of a set of symbols to designate location of tabulated material, as explained later, the sheet may be used to determine progress of the work. The limit of usefulness of the work sheet and estimate blank is governed by the degree of detail desired and the time and effort which the estimator is willing to devote to get it.

WORK TO BE ESTIMATED

Work required for the installation of a steam or water-heating system may be classified as follows: (a) the boiler must be placed and set up, (b) the radiators must be placed and connected, (c) the walls, ceilings and floors may have to be cut for pipe runs, (d) all pipe mains, branches, risers, etc., must be erected, (e) the smoke-pipe connection made, (f) water service connection to boiler made, (g) a test of the plant should be run, (h) radiators and pipe should be bronzed or painted, (i) ceiling and floor plates installed, (j) boiler, pipe and fittings covered, (k) basement pipes painted.

Each of the foregoing operations is distinct, and the estimating of labor on each must be considered separately.

It is the usual practice, however, in preparing an estimate, to "take-off" quantities first, and, where feasible, to estimate the labor required for putting that material in place where a make-up is involved. As the essential in so doing and, in fact, in the preparation of the entire estimate, is to be sure that everything is included and nothing omitted, it is best to follow a logical method of listing the various items. Some items, finishing quantities for example, are easier and more quickly handled when other quantities on which they depend have first been "taken-off." For instance, having listed

*Copyright, 1928, Ara Marcus Daniels.

ESTIMATE SHEET

JOB NO. _____

OWNER _____

LOCATION _____

PREPARED BY _____ DATE _____ CHECKED BY _____ DATE _____

NO	ITEMS	MATERIAL	LABOR
	BOILER		
	SAFTY VALVE		
	BLOW-OFF COCK		
	STEAM GAGE		
	ALTITUDE GAGE		
	BOILER REGULATOR		
	THERMOMETER		
	SMOKE PIPE, FT.		
	ELBOWS		
	TEES		
	DAMPERS		
	CHAIN		
	PULLEYS		
	BOILER COVER. LBS.		
	PIPE COVERING		
	FT. SIZE KIND		
	COVERING FOR FITTINGS		
	LBS. ASBESTOS CEMENT		
	ELBOWS, 90°		
	ELBOWS, 45°		
	TEES, STRAIGHT		
	ELBOWS, REDUCING		

NO.	ITEM	MATERIAL	LABOR
	RADIATORS, SQ.FT.		
	SECT. HGT. COL.		
	" " "		
	" " "		
	" " "		
	" " "		
	" " "		
	" " "		
	TOTAL SQ.FT @		
	TOTAL SQ.FT. @		
	TOTAL SQ.FT. @		
	INDIRECT RADIATORS		
	CABINETS, HEAT		
	REDUCING TEES		
	UNIONS, SCREW		
	UNIONS, FLANGED		
	PIPE HANGERS		
	BUSHINGS		
	NIPPLES		
	OTHER VALVES		

NO.	ITEMS	MATERIAL	LABOR
	EXPANSION TANK		
	GAGE GLASS		
	GOCKS		
	HEAT GENERATOR		
	HEAT REGULATOR		
	THERMOSTAT		
	FLOOR, CEILING PLATES		
	BRONZING MATERIAL		
	LBS BRONZE		
	GAL. LIQUID		
	ENAMEL		
	PAINT		
	PAINT		
	GALS		
	"		
	"		
	RADIATOR VALVES		
	RADIATOR TRAPS		
	UNION ELBOWS		
	OTHER MATERIALS		

Fig. HSE-2-2. A Typical Detail Estimate Sheet for the Heating Contractor

COMPILATION ESTIMATE SHEET OWNER_____
LOCATION_____
JOB NO.___
PREPARED BY____ DATE____ CHECKED BY___ DATE___

QUANTITY	ITEMS	MATERIAL COST	LABOR DAYS	LABOR COST	TOTAL COST
	BOILER, STEAM OR WATER				
	BOILER TRIMMINGS, COMPLETE				
	RADIATORS				
	"				
	"				
	"				
	"				
	EXPANSION TANK COMPLETE				
	HEAT REGULATOR, ETC.				
	PIPE, ESTIMATE SHEET NO.				
	PIPE CUTS, " "				
	PIPE THREADS, " "				
	MAKE-UPS " "				
	FITTINGS, " "				
	" " "				
	" " "				
	VALVES " "				
	" " "				
	FLOOR, CEILING PLATES "				
	CUTTING " "				
	BRONZING " "				
	PAINTING " "				
	OTHER MATERIALS " "				
	FREIGHT				
	CARTAGE				
	R.R FARE, BOARD,				
	MISCELLANEOUS				
	TOTAL				
	OVERHEAD				
	TOTAL				
	PROFIT				
	NET ESTIMATE				
	ALLOWANCES				
	BID TO SUBMIT				

Fig. HSE-2-3. Typical Form for Compiling Totals in Making Up an Estimate

and totaled the length of pipe of different sizes, the "taking-off" of covering requirements needs reference only to the work sheet on which total pipe quantities are listed.

Every accurate estimator who has had experience will have developed a plan of procedure which best suits his needs and by which he has found he can work with speed and accuracy. Therefore, any order of handling quantities from the plan to the work sheet should be viewed as suggestive, amenable to the requirements of the work. The following order is a logical one. Commence with the boiler and trimmings and "take-off" the remaining items as follows: Radiation, pipe and fittings, expansion tank, cutting smoke-pipe, covering, bronzing and painting, ceiling and floor plates, miscellaneous.

TYPICAL ESTIMATE SHEETS

Figures HSE-2-1* and HSE-2-2 illustrate typical estimate sheets. In preparing or having prepared such sheets, the essential is to be sure that space is provided for everything, so that no omissions will occur.

*Published with Lesson No. 29, January, 1928.

Sheets of this kind should be of such size as to make for convenient handling when in use and to be suitably filed.

On sheet of Fig. HSE-2-1, spaces for many of the items are ruled off in small squares. In taking off material, a designating mark may be placed in each square and totals carried over after all work has been done. In cases where larger jobs are handled, a small dot may be used so as to count more of a particular item to a square. Obviously, in preparing estimate sheets, the number of squares provided are amenable to the requirements of the estimator.

Estimate sheets may be used to give detailed information about the job, as for instance, should it be desirable to distinguish between fittings or labor required for basement piping and that above the basement, or otherwise, it is only necessary to select a suitable entry mark, for example, a circle for basement material, a straight line for other material. In "taking off" pipe, a totaling line or lines with small "B" on it might indicate that all pipe above that line was to be used in the basement with "1st" noted under the next line and so on, as far into detail as may be desired.

Careful tabulation of quantities pays dividends in time saved and accuracy secured. For instance, to know the number and kind of fittings to be covered with insulation and to have a cost card on coverings for fittings, assures an easy and accurate estimate of quantity of covering material needed.

ESTIMATE COMPILATION SHEET

Figure HSE-2-3 illustrates a suggested form for compiling the estimate. Here many items are grouped and tabulated. This permits any glaring errors in costs to be spotted quickly by a good estimator and enables him to put his finger on the item with ease.

GROUPED QUANTITIES

The cost of preparing estimates, strictly, is an overhead item. Therefore, it is in the interest of good business to devise ways and means whereby estimating time can be reduced and conserved.

Certain groups of material and labor which are duplicated in a job may be combined into units for estimating purposes. For example, branch-connections from the main to the heel of risers; offsets; extensions from riser to radiator; radiator connections from riser lines, etc.

In considering branch connections to riser heels, there are four types of connections as shown in Figure H-2-2, for each of which a cost card should be prepared. Practically the only variable quantity is the pipe length, so in preparing cost cards, they should cover different lengths of horizontal and vertical runs. On each cost card should be

(*Continued on Page* 85)

Public Building Ventilation With Automatic Roof Ventilators

How Increasing Building Costs Are Directing Attention of Engineers and Architects to the Possibilities in This Connection

By George D. Beals

UNTIL quite recently the application of roof ventilators was practically confined to the ventilation of factories and other similarly-enclosed spaces, such as farm buildings, barracks, or auditoriums. When installed on buildings of this character they proved themselves an effective and inexpensive method of ventilation. Their use in connection with the ventilation of public buildings, however, where a more or less extensive system of duct work was required, rarely was attempted, as the ventilation of buildings of this type was considered solely the province of the power-driven fan.

This attitude on the part of designers has undergone somewhat of a change during the last few years as the rapidly-increasing cost of building has directed the attention of engineers and architects to the possibilities of the roof ventilator, not only as a means to reduce equipment costs and subsequent operating expenses, but to conserve valuable space and yet produce satisfactory ventilating results.

HOW ROOF VENTILATORS WERE APPLIED TO A THEATER BUILDING

As an illustration of the extent to which roof ventilators are being applied to public buildings throughout the country, a recent installation of such a system in a building combining a theater and masonic temple is typical. Separate fan systems for fresh-air supply were provided for the theater auditorium, lodge rooms, and banquet hall. Exhaust fans were installed for kitchen and banquet-hall exhaust and also for the auditorium. An auxiliary exhaust system for the auditorium employed two 72-in. gravity roof-ventilators while an auxiliary system for the banquet hall, which was located in the basement, utilized two 48-in. ventilators. The lodge rooms, card and billiard rooms, toilets, and other miscellaneous small rooms in the building all were ventilated with gravity roof ventilators as individual units. This building now has been in operation for over a year and the ventilation has proven very satisfactory.

INSTALLATION IN 28-ROOM SCHOOL BUILDING

An installation of exhaust ventilation exclusively employing gravity roof ventilators was made a short time ago in a twenty-eight room schoolhouse in a Connecticut city. In this building the attic space was partitioned into several collecting chambers which received the vents from the various rooms. A 60-in. ventilator, containing an automatically-controlled night damper, was installed above each chamber. An exhaust system, arranged to take care of either the gymnasium or auditorium, as desired, required the use of two 60-in. ventilators. Fresh air supply to all rooms was provided by means of unit heaters placed in the rooms.

The foregoing examples are typical of hundreds of successful roof-ventilator installations which have been made in public buildings of all types during the past few years. It is true that this equipment has found its newest and most promising market in connection with the plenum system of ventilation as a successor to the power-driven exhaust fan or aspirating coil. However, it is not limited to this application alone as it also has been used successfully in the indirect-gravity system and the fan-furnace heating system, particularly as applied to schoolhouse and church work. Of course, it has its limitations and should not be used, for instance, in conjunction with an exhaust system for chemical laboratories, nor, as a matter of fact, in any application where the gases to be removed are heavier than air. Neither are they adapted to laundry work or other applications requiring the removal of steam.

PRECAUTIONS TO TAKE IN USING ROOF VENTILATORS

In designing a plant, contemplating the use of roof ventilators, precaution must be taken to combat possible adverse wind effects on the system. For example, if several vent flues terminate at the attic floor, the attic space serving as an exhaust chamber from which one or more ventilators exhaust, the vents from rooms on the windward side of the building will have the desired upward flow into the attic space while those on the leeward side may produce a down draft. With such a collecting-chamber arrangement this possibility is always imminent in the gravity system while, in the plenum system, it is present only when the supply fan is not in operation. This difficulty may be mitigated by grouping the flues, providing a separate ventilator for each group, and extending each individual vent up into the base of the ventilator, at least as far as the top of the curb.

Another point of importance in the design of a gravity system is a realization of the fact that a

ventilator provides an indirect, rather than direct, supply of air to a building. For this reason, if the supply of air is left to leakage through crevices around doors and windows and no adequate provision for air intake provided, a roof ventilator cannot accomplish in actual service a capacity equal to its catalog rating. This is because the supply of air will be restricted, due to the resistance to its entrance.

LACK OF AUTHORITATIVE OPERATING DATA

Among the troublesome problems facing a designer of a ventilating system is a choice of the proper size, number of units, and type of ventilator best adapted for the particular project at hand. The real authoritative data available on this subject are extremely limited and manufacturers of this equipment have just begun to distribute engineering information of real value to the trade.

It is to be regretted, but nevertheless is true, that designers always have looked with some mistrust on the published ratings of roof ventilators. This suspicion is not unnatural when one considers the great range of capacities claimed for the various types, and realizes that each manufacturer has calculated his ratings from the result of a test conceived by himself and making use of whatever facilities he had at his disposal for this purpose. In THE HEATING AND VENTILATING MAGAZINE for May, 1927, the writer submitted an outline of a set-up for standardized ventilator testing, and, judging by the remarks received, feels that some definite action will be taken on this matter in the near future.

SELECTING THE TYPE OF VENTILATOR

As to the selection of type, the designer needs something of a knowledge of roof ventilator mechanics to permit him adequately to protect the interests of his clients. His choice may range between the most elementary form of storm cap, as fabricated by any sheet-metal worker, and one of the more complicated forms of patented heads. The performance of any ventilator depends both upon the effectiveness with which it applies the forces of stack action in the vent flues, and the external winds blowing over it. The effects of stack action are so well known that we need not dwell upon them here, but the effect of wind action and the manner in which it most efficiently can be applied are sometimes misunderstood.

EFFECT OF WIND ACTION

To describe briefly this phenomenon, the wind striking the ventilator splits in its natural course and passes around the head. These diverted currents of air, uniting at some distance beyond the obstruction, this distance depending upon the shape of obstruction and velocity of the wind, form an area of low pressure or partial vacuum on the leeward side of the head. This vacuum area acts as a suction pump on the air within the building.

The most efficient ventilators are those that develop a large and effective low-pressure area and also provide a direct path of minimum resistance for the egress of the air. The efficiency of suction is increased if the passing winds are deflected around the head and in an upward direction, and if the entrance of wind into the head is minimized.

Some manufacturers attempt to increase the exhausting capacity of their product by applying the wind on the ejector or injector principle within the head. In many cases the construction of passages to achieve this result adds such resistance to the escape of the air, and so reduces the effectiveness of the vacuum area, that it not only defeats its purpose but adds considerable expense to the cost of production. Tests conducted by the Bureau of Standards, and by others, have demonstrated that ventilators of the simplest construction, conforming to the principles stated above, are among the most effective.

The writer feels that not only economic conditions but advanced practice in design are instrumental in promoting the automatic roof-ventilator industry to a major position in the mechanical field. He believes that two things are essential to the industry to hasten development of this era and to make permanent its benefits, namely, a standardized code for ventilator testing and closer co-operation of ventilator manufacturers for ethical purposes.

New Home-Study Course in Gravity Steam and Water Heating

(*Continued from Page* 83)

itemized, for each different size of pipe, the fittings required, and all operations requiring labor. Such "grouped quantity" cost cards must be very carefully prepared and the cost data, especially as regards the labor item, should be entered only after taking the average of the actual time spent in erecting a number of any typical group connections. Such studies also offer the means of checking on construction and often may point the way to changes that will result in material savings in labor charges.

OTHER ITEMS FOR THE ESTIMATE

The sheet of Figure HSE-2-3 contains spaces for items such as freight, cartage, railroad fare, board, lodging, carfare, superintendence and various incidentals.

After all expense items have been totaled, a charge for "overhead" should be added. This subject of overhead is a study within itself and is not considered within the province of this course. Suffice it to say that every job figured should carry its share and every contractor should endeavor to the best of his ability to know the proper amount or percentage to include to cover it.

Profit is then included, and the total estimated cost obtained.

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

MEMBER

National Publishers' Association
Associated Business Papers, Inc.
Audit Bureau of Circulations
National Trade Extension Bureau
American Oil Burner Association

Vol. 25 February, 1928 No. 2

Published Monthly at New York, N. Y., by the
HEATING AND VENTILATING MAGAZINE COMPANY
Executive and Editorial Offices, 386 Fourth Ave., New York.

A. S. ARMAGNAC . . . . . President
GUSTAVE PETERSEN . . . . . Treasurer

EDITORIAL DEPARTMENT
A. S. ARMAGNAC, Editor. P. E. FANSLER, Associate Editor.

ADVERTISING DEPARTMENT
G. PETERSEN, Manager.
GEORGE A. BROWN, Eastern Representative.

Western Office . . . . . 105 So. Dearborn St., Chicago
CLIFF W. PRESDEE, Manager

European Representative
W. G. Hollinworth,
124 Wrottesley Road, Harlesden, London, N. W. 10, England

Subscription	$2.00 per year
Canada	2.50 per year
Foreign Countries	3.00 per year
Back Numbers	50 cents each

WHILE various methods have been proposed for simplifying the rating of radiators, the manufacturers have taken the bull by the horns in arriving at a common basis, namely, the equivalent square feet of surface. This may or may not be the actual amount. The figures are based on the heat emission of the radiator, but as all parts are not equally efficient, the amount of surface which transmits 240 B.T.U. per hour is designated 1 sq. ft. Manifestly, this method cannot be entirely accurate, due to the variation in the arrangement of the heating surfaces in the different types, but nevertheless it will be welcomed as a relief from the rather chaotic condition which has prevailed in connection with the rating of radiators, particularly those of the tubular type.

On another page, we present the arguments of one manufacturer for the rating of radiators on a B.T.U. basis. In lieu of a general agreement on such a method, the basis now offered will prove, at least, a working substitute.

THIS issue contains the concluding installment of THE HEATING AND VENTILATING MAGAZINE'S Home-Study Course in Gravity Steam and Water Heating, under the authorship of Ara Marcus Daniels. The occasion deserves more than passing notice as it marks the successful completion by Mr. Daniels of a work that will take rank as one of the standard treatises on the subject. Since November, 1924, when the course was inaugurated, the lesson-sheets have appeared regularly in each issue of the magazine. As fast as the text was published it was reprinted in loose-leaf form, the whole work constituting a handbook of convenient pocket size. To those taking instruction in the problems included in the course, the corrected lesson-sheets, of a size corresponding to that of loose leaves, form an integral part of the handbook where they may be consulted when similar problems arise in practice.

In its reprinted form the course makes an impressive volume and one which, we dare say, will long serve as a guide to those desiring to obtain a working knowledge of the art. Even to the more experienced men in the industry, the volume already has made its appeal as a reference book for daily use.

SPECIFICATION-WRITING is one of those things which, like Topsy, "jes' growed." Evidence of the lack of uniformity is to be seen on all sides and this was confirmed when a recent editorial request for typical specifications brought forth a variety of texts as remarkable for the differences in their general arrangement as for their treatment of specific clauses.

In an endeavor to give our readers the benefit of the experiences of others in specification-writing, we shall inaugurate, in next month's issue, a series of articles on the general subject of specifications, with special reference, of course, to heating and ventilating work. One of the features of the articles will be the presentation of typical clauses in such a form that they may be filed in a card index and used, where possible, verbatim. The articles will embody the experiences of an engineer of many years' experience in the heating and ventilating field who has had plenty of opportunity to observe how, as well as how not, to do it.

ANOTHER new series of articles beginning in the March issue will be devoted to fundamentals. This writer recalls very well a conversation with Clifford M. Holland, for whom the Holland Tunnel, between New York and New Jersey, was named, on the subject of the training of young engineers. Mr. Holland was arguing against specialization. "Give them fundamentals," he urged. "How did I know, when I was at Harvard, that I was to become a tunnel engineer? But I had my grounding in fundamentals and when the time came for me to undertake the building of a tunnel, it was a matter of applying my knowledge of fundamentals to that particular problem."

The new series will bring out many points which, no doubt, are familiar to our readers. On the other hand, not a few of the items, we feel sure, will serve to refresh our minds on the matters discussed and, possibly, shed new light on subjects which may not clearly be understood.

American Society of Heating and Ventilating Engineers

Heating Engineers Review Work of the Year

Interest Centers on Activities of Research Committee in Broadening the Society's Research Work and in Developing Co-operation with Allied Organizations

THAT the year 1927 was marked by a greatly-stimulated interest in the determination of fundamental and underlying facts on all phases of heating and ventilation engineering was shown at the thirty-fourth annual convention of the American Society of Heating and Ventilating Engineers, held in the Hotel Pennsylvania, New York, January 23-26. The evidence was presented in the form of papers and committee reports, and, although none of the codes that have been under preparation were accepted in their final form, the tentative acceptance of the standard test code for heat transmission through walls, and the evidences of material progress in consummating the codes for rating low-pressure boilers, for testing air-cleaning devices and for the heating and ventilation of garages, proved that those members entrusted with committee appointments had spent an active year.

Prof. A. C. Willard
President, American Society of Heating and Ventilating Engineers

In particular was there material evidence of the devoted and unselfish work of Sam R. Lewis, chairman of the Committee on Research.

It is well known that Mr. Lewis has smilingly faced the loss of no small part of his year's income as a consulting engineer, because of the large portion of his expendable energy devoted to the interests of this committee. When the plan for co-operative research shall have been extended to its ultimate, bringing laboratories of many of the great engineering schools into close working agreements with the society, and when the results of this work shall have been made available to the heating, ventilating and architectural fraternity, then will Mr. Lewis's personal sacrifice be more fully appreciated.

An outstanding achievement accomplished under the direction of President Anderson, rendered more easy of accomplishment by virtue of the fact that Harry M. Hart, a prominent member of the society, also was president of the Heating and Piping Contractors National Association, was the bringing together of these two great organizations for the purpose of agreeing jointly to matters of code and practice in matters of mutual interest.

The first tangible and outstanding result of this co-ordination was the acceptance, by each of these organizations, of the standards of pipe capacities, long a vexing problem to the technical committees of both. It seems probable, too, that the code for boiler selection, adopted last year by the Heating and Piping Contractors National Association, and the code for the rating of low-pressure boilers, "adopted in principle" at the last semi-annual meeting of the society, will become merged in a common code, giving both a basic rating for each type and size of boiler and a method of selection.

The program for the convention was extensive, and for the first time required four days. The spirit of progress, evident at every turn, was well exemplified in the report of the Guide Committee, when Perry West laid down specific recommendations for future betterment of the *Guide*.

The financial affairs of the society were shown to be in excellent condition, largely due to the acumen of Thornton Lewis, chairman of the finance committee, and the earning of a net profit of $10,000 on the *Guide* reflects the skill of Secretary A. V. Hutchinson, who largely was responsible for making the *Guide* a paying proposition.

Afternoon Session, January 23

President F. Paul Anderson opened the meeting with a characteristic greeting and preamble. "America," he said, "has long been known as a nation of money-getters. The dollar was the measure of success; the output of vast mechanical plants the acme of human endeavor. Conditions, fortunately, have changed in the last few years, and we find America exemplified as a nation of idealists. Our idealism takes a different form from that of olden times—as was beautifully expressed by a speaker at a recent engineering gathering, 'The artists of America are in the laboratory.'"

President Anderson introduced H. B. Hedges, chairman of the entertainment committee, who briefly recounted the program prepared for the visiting members and their ladies.

OFFICERS FOR 1928

Reporting for the tellers, J. A. Donnelly stated that the slate prepared by the nominating committee had been elected in toto, with almost unanimous ballots. The new officers are:

President, Prof. A. C. Willard, University of Illinois, Urbana, Ill.

First vice-president, Thornton Lewis, Philadelphia, Pa.

Second vice-president, L. A. Harding, Buffalo, N. Y.

Treasurer, Walter E. Gillham, Kansas City, Mo.

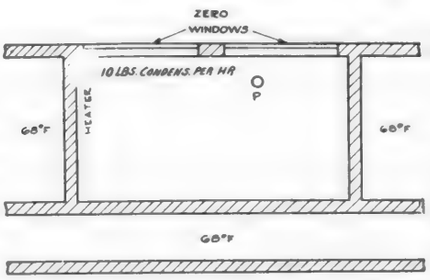
Members of council: (three years) H. H. Angus, Toronto, Ont.; N. W. Downes, Kansas City; Roswell Farnham, Buffalo, and F. B. Rowley, Minneapolis.

Members of the Committee on Research: A. R. Acheson, R. V. Frost, D. S. Boyden, L. A. Harding, and F. B. Rowley.

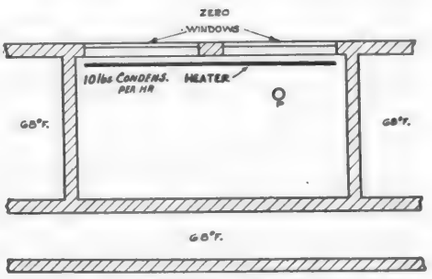
Dr. C. W. Brabbée was then presented, and reported briefly on his attendance at an international meeting of engineers in Germany to which he carried greetings from the society. He said that the reception of his message was received with great enthusiasm, and that he was asked to return with expressions of warm esteen from European engineers. Doctor Brabbée then turned to his paper.

Test Methods for Radiators and Boilers

Reiterating his belief that the conventional method of rating radiators by the amount of condensation does not provide a true measure of the effectiveness of radiators, as applied to the production of human comfort, Dr. C. W. Brabbée, director, Institute Thermal Research, American Radiator Company, suggested the adoption of an entirely new procedure. His paper was frankly a review of previous presentations on the same subject, except for the introduction of a refined scheme of boiler test set-up and technique.



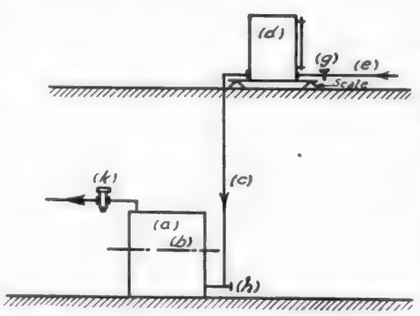
Arrangement of Room With One Outside Wall and Vertical Steam Pipe in an Outside Corner Used to Determine Comfort Effect on Person at Point P



Arrangement of Room With One Outside Wall and With Flat Heater Extending Entire Length of This Wall. Used to Determine Comfort Effect on Person at Point P

Doctor Brabbée told of tests made on more than 300 radiators, and of the paradoxical discovery that, for example, a radiator having 33.4 sq. ft. of actual heating surface, condensing 7.9 lbs. per hour, gave a more comfortable room condition than another radiator having 67.5 sq. ft. of surface and condensing 16.3 lbs. per hour. As he expressed it: "The new definition gives the greater value to that radiator which affords maximum comfort with minimum condensation; i.e., minimum material and fuel cost."

A simple and extremely accurate method of testing domestic boilers was described, in which the steam generated by the boiler is condensed in a surface condenser. The quantity of condensing water and the entering and leaving temperatures afford a ready means of computing the boiler heat output. The heat units delivered by the boiler are measured by means of the condenser, entirely independent of all errors in water line, steam pressure, wet steam or other factors.



Usual Set-Up for Boiler Test

A suggested method of providing for a test of a boiler that is to be operated on a high stack, where a high stack is not avaliable for the test, was outlined. Here Doctor Brabbée provides a by-pass to a low stack, with a fan located in the by-pass. A shutter, located at the upper junction of the stack and by-pass, makes it possible to secure close regulation at any desired draft within, of course, the limit of the fan.

Discussion was opened by Prof. E. H. Lockwood who recounted experiments by earlier investigators leading apparently to similar conclusions. He said that he believed that the useful and the total heat emitted by a radiator would be found to agree within close limits, and that he considered the measurement of condensate a satisfactory index.

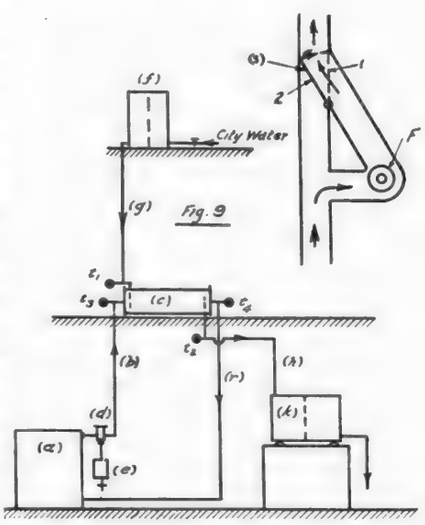
Director Houghten said that he di not feel that sufficient data had been accumulated and analyzed to justify the adoption of any unit of radiator rating such as advocated by Doctor Brabbée. He said that apparent differences in radiator characteristics might as well be due to room conditions as to be inherent in the radiators.

The discussion was taken up by Messrs. Bolsinger, Carrier, Rowley, May, Mensing and Ritchey, some partially agreeing with the ideas expressed by Doctor Brabbée and others taking different views.

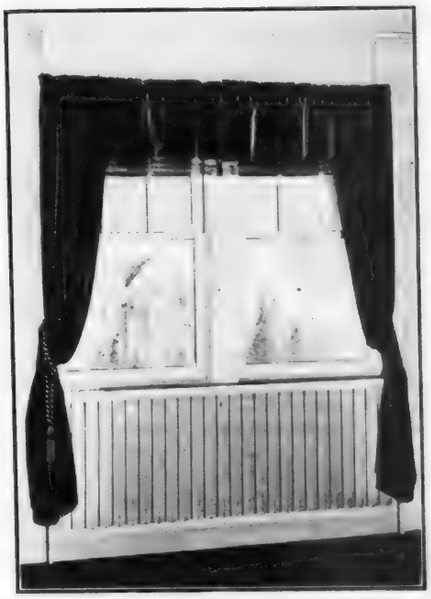
President Anderson closed the discussion and called on Director Houghten, of the Research Laboratory.

Proposed Methods for Testing Radiators

A comprehensive survey of the present status of radiator-rating methods,



Arrangement for Boiler Test Using Surface Condenser as Suggested by Dr. C. W. Brabbee



Arrangement of "Fantom" Radiator, Developed by Doctor Brabbee, Which Gave High Comfort Effect

of the many and varied factors that enter into radiator rating and of the test methods developed by different investigators, formed the background of a paper presented by F. C. Houghten, director, Research Laboratory, and S. R. Lewis, chairman, Research Committee.

The authors agree that there may be merit in the method suggested by Doctor Brabbée for rating radiators, but maintain that too little evidence has been produced to warrant adoption at this time. The wide differences of opinion are brought to a focus by the authors when they state: "The work of C. W. Brabbée indicates that most satisfactory results are to be had with a radiator emitting a larger percentage of its heat as direct radiation, while the work of R. V. Frost indicates that a radiator emitting most of its heat by convection is most effective."

Characteristics of an ideal test room are submitted, and a method of attacking the problem is suggested. The authors recommended building a test room in which many perplexing problems might be solved. Among the most important of these were the following:

"1. Should a new unit of heat output be used in rating radiators to replace the equivalent square foot defined as 240 B.T.U. per hour, which has a double and confusing meaning? A new unit to be called a Kent has been suggested. If adopted, a Kent will be defined as some definite rate of heat output in calories or B.T.U. per hour. If adopted this new unit should represent some whole number of heat units which can easily be divided into the estimated heat loss from the building or room to be heated, as for example, a Kent may be defined as 250, 500 or 1000 B.T.U. per hour and units of radiation then will be rated as so many Kents per section or unit.

"2. Is condensation the best measure of rate of heat output from the radiator?

"3. What should be the size of the room?

"4. At what point in the test room should the temperature of 70° F. be maintained as representing that of the room?

"5. What difference in heat output will a radiator show depending upon the temperature of the outer room or upon the temperature of the inner surface of the inner room?

"6. Is it feasible to test radiators in a room with only one exposure, and how much will the heat output of a radiator tested in such a room differ from that shown for the same radiator tested in a room with four exposures?

"7. Is the rate of heat loss from the radiator materially affected by removal of heat from the test room by transmission through the walls rather than by air change?

"8. What correction should be applied to the heat output from a radiator when tested in a room at a temperature other than 70° F.

"9. How best can the temperature of the outer room be maintained?"

Discussion of this paper was initiated by S. R. Lewis, who read a communication from Konrad Meier, who, in an interesting and comprehensive analysis of the situation, agreed with the author that the time had not yet come for a change in the method of rating or the unit of reference for radiator performance. Interjecting his personal ideas, Mr. Lewis said that, in a large measure, he agreed with Doctor Brabbée—that sufficient research should be done to establish the validity of his arguments.

L. A. Harding suggested that, in what had gone before, the matter of starting-up load had not been given consideration. He accepted a rating for a radiator to offset a given heat loss in zero weather, but wanted to know what that radiator would do in heating up the same room if it had been allowed to cool down to, say, 20° F. F. D. Mensing, R. V. Frost, F. B. Howell, A. A. Adler and J. F. McIntire participated in the discussion.

Evening Session, January 23

Co-ordinated research furnished the theme for the addresses and discussions of the evening session, the guest speaker being Dr. F. W. Stratton, past-director of the U. S. Bureau of Standards and now president of the Massachusetts Institute of Technology.

It is evident that the program of research fostered by S. R. Lewis will be a large factor in broadening both the scope of the program of the Committee on Research and the attitude of the members of the society toward other organizations. This basic note of co-ordination and co-operation in research was the theme of Doctor Stratton in his address.

Dean Anderson, in the chair, opened the session by calling on S. R. Lewis, chairman, Research Committee. Mr. Lewis, in a characteristic, lively talk, told the story of his adventures in bringing about the present tie-up with prominent colleges. He told of finding the college research staffs eager for co-operative investigation into basic problems, but generally at a loss to know what to do and the best way of doing it.

To illustrate his point, Mr. Lewis told of the difficulty in bringing about certain chemical reactions without the agency of an extraneous agency—a catalyst—in the presence of which the desired reaction was carried out. "He hoped," he said, "to make the Research Committee the catalyst in this case, and, through its functioning, bring about a broad program of co-ordinated and co-operative research that would result in the solution of the problems now confronting the industry."

President Anderson briefly sketched the origin and growth of the Bureau of Standards, of which, for 23 years, Doctor Stratton was director. He told of the beginnings, aims and development of that outstanding institution of technical education and research, the Massachusetts Institute of Technology, of which Doctor Stratton is the executive head. With this, he said, "and the general knowledge that Doctor Stratton stood without a peer, in his field, no introduction of the guest was necessary."

DOCTOR STRATTON'S ADDRESS

Doctor Stratton stated that, in his opinion, the greatest factor in the recent industrial development of the United States was the getting-together of similar industries, not in restraint of trade, but to promote trade through research. "For fifteen years," he said, "the funds and energies devoted to industrial research have been expanding, and to-day, under the co-ordinating influences of national and association organizations, this work is going on at an ever increasing rate.

"Getting people together," continued Doctor Stratton, "has been one of the prime functions of the Bureau of Standards—more important, to my way of thinking, than the actual physical work in establishing standards. Time was when manufacturers in any line had no contact with each other, and trade jealousies were rampant. Many times it has been my pleasure to get two such men together for luncheon or dinner and establish the first germ of co-operation in solving mutual business problems. These, frequently, were of a technical nature and the bureau began to function in the interests of these manufacturers. Before long similar relations were established in and between groups, and in this way co-ordinated

and co-operative research has developed."

Doctor Stratton then told story after story to illustrate the functioning of the Bureau of Standards in this development of industrial cohesion and technique. "Synthetic chemistry is one of the outstanding causes of our present development," he said. "Gas, for instance, is one of the most valuable servants of man. To-day gas can be made from anything, and anything can be made from gas." Touching the field of heating and ventilation, Doctor Stratton suggested lines along which improvement can be made.

Van S. Manning, formerly head of the U. S. Bureau of Mines, was invited to express his opinion of the value of research, and told of several experiences, notably one in connection with the development of gas masks during the war, confirming the statements previously made.

Willis Carrier, speaking of the future of thermal engineering, said that we were just awakening to an appreciation of the benefits of air conditioning, and that the greatest need was for more research on the puzzling problems that constantly are coming up.

RESEARCH ACTIVITIES OF THE AMERICAN GAS ASSOCIATION

Speaking on the subject of "Standardization in Industry and Correlation in Research," H. Leigh Whitelaw, chairman of the Research Committee of the American Gas Association, told of the undoubted benefits that already have accrued through the policy of standardization that, only recently, has begun to permeate American industry. He outlined the research program of the A. G. A., and said that already results were apparent.

F. C. Houghten referred to the great breadth of research program that could be covered through co-operation with engineering schools, and Doctor Stratton told of his desire to turn out a few first-class young research engineers each year. He outlined the plan recently adopted whereby students in certain courses are required to do at least a year's work in industrial organizations prior to graduation. Definite relations have been established with several of the largest public service and industrial organizations in New England, and the plan seems to be working out to the mutual advantage of all concerned. Henry Gombers, H. M. Hart and R. G. Creviston joined in the discussion.

E. B. Langenberg threw a bombshell into the meeting when, in a glowing tale of the ease and completeness with which a rating code had been adopted by the manufacturers of warm-air furnaces, he flung out the challenge that the warm-air furnace manufacturers were getting the bulk of the house-heating business, and that this field was not of secondary value. He urged the co-operation of all manufacturers in establishing mutually satisfactory rating and other codes so that sales resistance might be lowered rather than increased. He said that air conditioning for the home was one of the biggest fields now confronting the industry.

President Anderson, with a graceful tribute to Doctor Stratton, adjourned the meeting.

Morning Session, January 24

President Anderson opened the session by introducing D. J. Meserole, a Brooklyn attorney, who had come to the convention expecting to find papers on domestic oil-burning on the program. Mr. Meserole spoke enthusiastically as a convert to oil burning and urged that his hearers join in spreading useful information on this subject.

REPORT OF THE COMMITTEE ON RESEARCH

Chairman S. R. Lewis briefly told of the activities of the Committee on Research and of his efforts to bring about co-operative investigations in university laboratories. He said that the U. S. Weather Bureau will make a study of atmospheric dust conditions in ten leading cities, using identical instruments. This will be the first Federal agency to undertake such a task, and should produce valuable data. He suggested a possibility of extending the co-ordinated research into the laboratories of large manufacturers who annually were spending large sums to develop basic data for their own needs. Several of these manufacturers had signified their readiness to assume certain studies under the direction of the Research Committee.

Widespread activities in research have resulted from the plans first made operative by the present committee on research, and, in presenting his report, Chairman Lewis briefly outlined the status of the research fund and the work that is being done at the laboratory and at those of the great technical schools collaborating with the society.

The plan evolved by this committee, of allocating problems in research to engineering schools especially equipped to handle certain kinds of work, the cost to be divided equally between the school and the society, has resulted in connections with several of the leading technical schools. Mr. Lewis and Director Houghten, of the Research Laboratory, have made many visits to these schools for conferences and studies, and, if this plan for joint research is continued and expanded, it is probable that a tremendous amount of research can be directed and utilized by the society at a minimum cost.

Mr. Lewis stated that a fund of $10,000, inherited from the previous administration, had been held intact, and that slightly more than $35,000 had been expended for research during the past year. He said that a larger fund undoubtedly could be used to advantage during the coming year, in view of additional college connections that could be made.

Reports of advisory committees on research were incorporated in the report by Mr. Lewis, these including: Committee on Infiltration, Prof. A. C. Willard, chairman, telling of the co-operative arrangement with the University of Wisconsin, whereby $1000 is to be expended by the university and a like amount by the society. This fund, during the 1927-28 school year, will be expended to investigate wall leakage. A comprehensive study has led to the construction of an elaborate testing plant, with suitable means for quickly shifting different sections of wall to the test apparatus. The inclusion of the Common Brick Manufacturers' Association in this program, with the substantial aid of $1500 and the supply of all necessary brick, has stimulated and broadened the attack on this problem.

Committee on Pipe Sizes, Harry M. Hart, chairman, reported that through co-operation with the Heating and Piping Contractors National Association, there had been arrived at a mutually satisfactory tabulation of pipe sizes. Mr. Hart also said that a study of the capacity of branches to radiators was under way, in co-operation with the Carnegie Institute of Technology.

Willis H. Carrier, chairman of the Committee on Temperature, Humidity and Air Motion, added to the report the story of activities at the laboratory, where an investigation is being made of the rate of metabolism and the rate of evaporation from subjects under varying conditions of wet- and dry-bulb temperature and air movement. Mr. Carrier suggested a line of study, to be participated in by physical scientists and members of the medical profession to determine the effect, in ventilation, of so-called air purity upon the animal organism, and, if possible, upon the human being. In this connection he said:

"It also is necessary to determine if there is an appreciable effect from what might be termed devitalized air, or any beneficial effect from what might be termed vitalized air. By this expression it is not meant that any appreciable change in chemical constituents but only the ionizing effect which may be produced in air in nature by the natural sun's rays or otherwise, or by artificial means giving an equivalent effect. It is quite possible that there is in outdoor air subjected to the ultra-violet rays of the sun and other ionizing forces a property very analagous to vitamins in food which science recently has shown us may be simulated by exposure to the ultra-violet rays, either natural or artificial, in analagous manner.

"It may be pointed out that so-called ozonizing equipment undoubtedly has an ionizing effect on air apart from the production of ozone, which is an indication of extreme ionization of the oxygen. It is possible that effective ionization can be produced in this manner or

by some other means, as by treatment with ultra-violet light artificially, without any material production of ozone, which in excess is objectionable, and that there may really be beneficial physiological effects from the naturally ionized air of outdoors, or a corresponding artificially ionized air indoors. In other words, it may be found possible, through the co-operation of the ventilating engineers with the scientists to produce an indoor effect exactly as beneficial as outdoor effect if there is found to be any really essential or important difference physiologically. It is recommended that the Committee on Research and the society obtain the co-operation of physical scientists and the medical profession."

Research on heat transmission through building walls is receiving an impetus through a co-operative arrangement at the University of Minnesota, according to the report of L. A. Harding, of the advisory committee on that subject. There also was recounted the experimental work with the Nicholls heat-flow meter, which has resulted in the collection of so many data that considerable time will be required to put the results in usable form.

Reporting the work of the Committee on Code for Testing Building Insulation, under the chairmanship of A. P. Kratz, Mr. Lewis said that the tentative code, presented at the meeting at White Sulphur Springs, had been revised in certain minor details, and that it was ready for final action by the society.

Activities of the committee on air-cleaning devices, Prof. F. B. Rowley, chairman, have resulted in a definite program now under way at the University of Minnesota, based on a study of existing methods of dust determination, together with the various problems that arise in their application.

Utilizing the exceptional equipment in the new thermal laboratory at the University of Kentucky, the committee to determine maximum boiler output, Dean F. P. Anderson, chairman, has carried out some preliminary tests to check up, to prove and to criticise the proposed code for boiler ratings. The report described the boiler and instrument set-up and told of many interesting questions that had come up during the progress of this study.

Concluding, Mr. Lewis suggested that the present flexible rules of the Committee on Research were admirable to work under, and should be continued. He also said that technical advisory committees should be kept small and active in order that the greatest amount of productive work be accomplished.

REPORT OF DIRECTOR OF RESEARCH LABORATORY

Director Houghten referred to his formal report with the suggestion that it was too long for presentation and should be read by all members. He told of some interesting developments since the preparation of the annual report. One related to some surprising indications of increased pipe capacity in radiator branches, and one to tests made on a slab of concrete using a Nicholls heat-flow meter. In this latter instance the data thus far accumulated clearly indicate a slowly-decreasing conductivity as the slab ages.

REPORT ON CODE FOR TESTING AIR CLEANING DEVICES

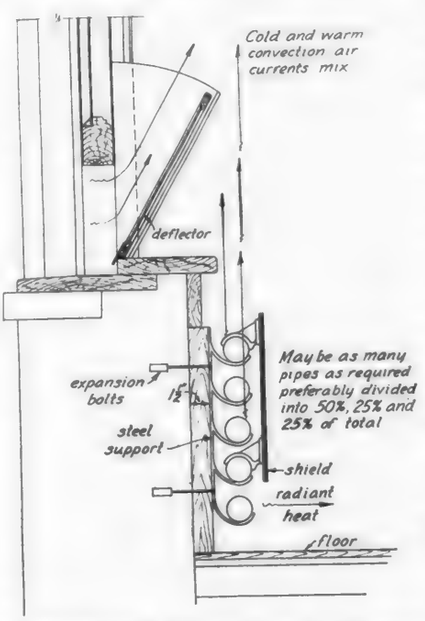
Prof. F. B. Rowley outlined the work of his committee in formulating a code for testing air-cleaning devices. He told of the many difficulties encountered and of how they were being surmounted. Turning from the subject, he expressed his belief that the plan of co-operative research with the colleges was as beneficial to the colleges as to the society. He emphasized the fact that in handling such work, the students were afforded exceptionally practical subjects for thesis work and that the teaching force also was benefited by the broadening influence of the contacts.

S. R. LEWIS HEADS SEARCH FOR "MYSTERIOUS INFLUENCE"

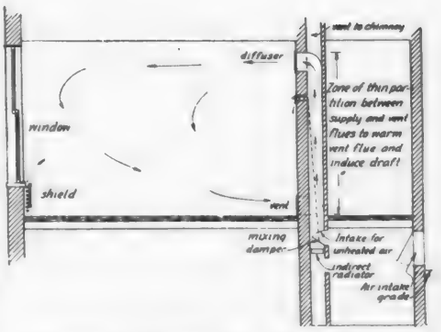
Presenting his paper, "Practical Ventilation for Schoolrooms," only by title, S. R. Lewis welcomed discussion of this important subject and paid a tribute to the spirit of co-operation evinced by T. J. Duffield, in his plans for a further study of school air conditioning in and about Syracuse, N. Y.

Practical Ventilation for Schoolrooms

S. R. Lewis, tolerant champion of mechanical ventilation for schools, read a paper on the subject of "Practical Ventilation of Schoolrooms," in which he exhibited an unusual regard for data derived by so-called open-window enthusiasts, and suggested the desirability



Arrangement of Direct Radiation and Deflector Suggested by S. R. Lewis for Open-Window Ventilation of Schools



General Scheme for Heating and Ventilation of Large Schools Evolved by S. R. Lewis

of getting to the real root of the problem, to see why the results of certain studies apparently favored the open-window scheme.

At the risk of being called "queer," Mr. Lewis ventured the opinion that there was some "mysterious influence" at the bottom of this matter, and, lest his hearers scoff, he reminded them that Doubting Thomases had a grievous time believing that mosquitoes were the mysterious influence in malaria and yellow fever. He classified the possible agencies as constantly-maintained lower temperature; ultra-violet or other invisible rays ordinarily stopped by common window glass; reduced motion of air; unheated air supply and physical stimulation due to continual and rather rapid temperature-variations.

Analyzing these factors, in the light of present-day knowledge, Mr. Lewis was bound to admit that "Not much in the way of a clue to the mysterious influence, outside of the five possibilities just named, is to be found, though age, race stock or other conditions yet may be found unexpectedly to govern the striking results which have been noted."

Mr. Lewis, on the basis of an arbitrary classification, then laid down his specifications for schoolroom ventilation. "For schools having four rooms or less," he said, "the jacketed stove and the warm-air heater, having provision for the admission of an adequate supply of fresh air, and having gravity exhaust, is perhaps the most practical system; the window system is not feasible in this type of building."

For the school having from four to twelve rooms, Mr. Lewis felt that a straightforward window-ventilation with direct steam heating might reasonably be installed. He described details of construction of a window deflector to give the best results. A well thought-out scheme for the radiation arrangement was presented; the under-window radiators to be constructed in three horizontal sections with separate supply and return valves. The top section having 50% of the total capacity and the two lower sections 25% each, it would be possible to regulate the heat input to match the temperature of the incoming air, using one of the small coils in early fall and late spring and the full radiation in mid-winter. The

vent flues for this class of school should be separate for each room all the way to the roof, where ventilators, preferably of the revolving type, should be used.

For the largest types of schools, Mr. Lewis advocated a mechanical system with positive supply and gravity exhaust. One fan might serve each room, or a group of rooms. The intake should be near the ceiling and the vent near the floor, and the arrangement such that inlet and vent ducts are adjacent for at least 6 ft. Heat transfer from the inlet to the vent duct then will stimulate the air flow in the latter and make it more positive when the ventilating system is in use. Direct radiation, for this type of school, should be similar to that advocated for the smaller class. In both cases radiator shields should be used, but the lowest 6 in. of radiator might be exposed so that the radiant heat can reach the feet of the children. By installing some indirect radiation at the base of the intake ducts, with a suitable damper and arrangement for admitting outdoor air, any desired proportion of outside air could be sent, unheated, to the rooms. Mr. Lewis said that such an arrangement could provide a room with the desired quantity of unheated outside air in a positive manner, which was beyond the ability of the open-window equipment. With this arrangement it would easily be possible to clean the air, or to ozonate it, both impossible with open window ventilation.

Referring to the possibility that a variable temperature might be found to produce optimum results, Mr. Lewis said that manufacturers of automatic temperature-control equipment were ready to furnish thermostats which would accomplish any desired cycle of variation.

Concluding, Mr. Lewis said:

"If window ventilation does give superior health results it gives these results because of some single inherent physical property of window ventilation, or because of some group of such properties, and certainly these properties do not appear to depend on any particular minimum space-per-pupil requirement.

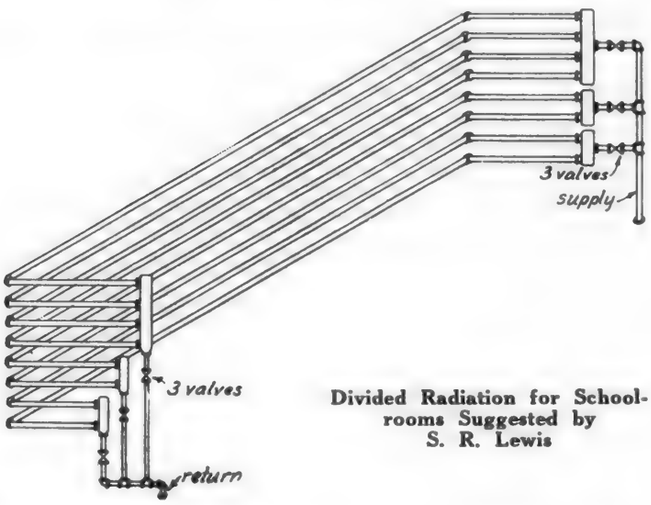
"No window or gravity system of ventilation can be depended upon to handle any specific volume of air.

"Taking into consideration the equipment required for consistent window-supply ventilation, there is no very great difference in first cost between it and a mechanical system. In this consideration the commission has demonstrated conclusively that in order to be operable, classrooms with window-supply ventilation must have excess radiation, automatic control, deflectors, vent flues which are positive in action and should have radiator shields.

"It is well known that if a consistent and specific volume of air must be handled most economically, the necessary energy to move the air will cost less and be more satisfactory via an electric motor than via a heated chimney.

"When considering relative differences in cost of labor for operating these various types of ventilation, time studies should be made to determine the influence on teaching efficiency of the more or less constant adjustment of windows and dampers required by the gravity-window systems, as well as the actual money value of the time given by the teachers to adjusting ventilation.

"If it can be demonstrated to attain equal health results, the mechanical arrangement, with its positive air delivery and accurate control, coupled with its diffusion virtues and its flexibility, is believed to be the most reasonable and logical type for ordinary investment."



Divided Radiation for Schoolrooms Suggested by S. R. Lewis

Additional Data on School Ventilation

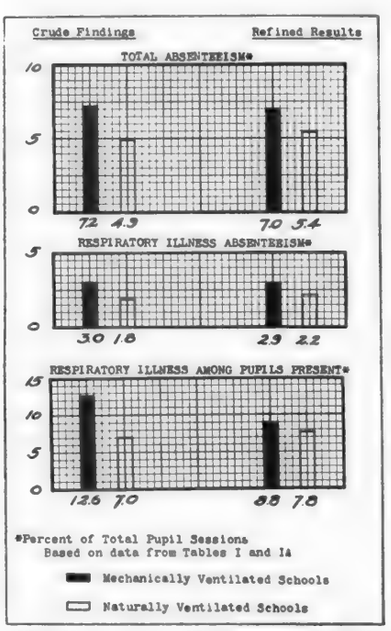
Bringing to the attention of the society pertinent data on the moot question of school ventilation, Thomas J. Duffield, executive secretary, New York Commission on Ventilation, presented a paper on "Effects of Mechanical and Natural Ventilation on the Health of School Children."

With pupils under observation, in six schools at Syracuse, N. Y., a field study is being conducted by the commission, with the co-operation of the Milbank Memorial Fund. Three of these schools are equipped for mechanical ventilation and the other three for the general observance of natural ventilation with heating by warm-air furnaces.

The study was formulated on the basis of respiratory illness (defined as coryza, pharyngitis, tonsillitis, laryngitis, bronchitis, pneumonia, tuberculosis, grippe, etc.) records being taken of pupils present with such illness, as well as of those absent. Mr. Duffield described the technique of the investigation and presented the results in tabulated form, under various classifications.

Mr. Duffield frankly stated that the data thus far accumulated are too meagre and the derived results only indicative, but he held that this beginning furnishes a reason for continuing to investigate the question from this angle. Summing up his reactions from a study of the findings presented, he said:

"If our original data had been based on the more reliable foundation of diagnosis of respiratory illness by competent persons, and had our follow-up of absentees been such as to preclude the possibility of falsification of cause of absence, and had the numbers of individuals included in our study been greater, we should be warranted in making the unqualified assertion of what this preliminary study strongly suggests, namely, that natural ventila-



Attendance and Health Records in Mechanically and Naturally Ventilated Schools—School Ventilation Study, Syracuse, N. Y. (1926-27)

tion has some inherent virtue which mechanical ventilation does not possess, or that mechanical ventilation involves some harmful influence from which natural ventilation is free.

"It shall be our endeavor through further studies to remove the doubts that cloud the findings of this preliminary study, and to demonstrate whether the high rate of air change is the causative agency in the excess of respiratory illness absenteeism in the mechanically-ventilated schools."

In a prepared discussion on this paper, Perry West said that he was forced to differ with Mr. Duffield in the interpretation of results presented. He regretted that more data on the physical quality of the air in these schoolrooms were not taken, and pointed out that, in many ways, these latest findings contradict those of the classic investigation, made in New York schools by the New York Commission on Ventilation.

Prof. A. R. Acheson also objected to the conclusions drawn by Mr. Duffield, as he did not believe that they were justified by the figures presented.

Major J. W. H. Myrick, school commissioner of Boston, asked to express his views, painted a vivid picture of the obstacles against which he has to contend in the Hub. He told of the difficulties of providing for proper operation of the ventilating plants that have been installed; of the "building custodians" (the term "janitor" is not used in Boston) who drive Packards to and from the schools and draw salaries equal to those paid to professors in many colleges. Major Myrick told of a survey of conditions in the Boston schools that showed only 13% of the ventilating plants in operation, leaving idle about $6,000,000 worth of equipment. As a colorful speaker, Major Myrick easily was the star of the session, and it was evident that, behind his laughter-raising quips and descriptions, lay a keen appreciation of the tragedy of the picture—the wastage of taxpayers' money and the failure to maintain atmospheric conditions easily possible, all because of stupidity and political expediency.

Mr. Tracy, of the Rochester School Board, asked permission to correct a statement, previously made, that the proposed Rochester experiments had been abandoned. "The school board," he said, "has appropriated $40,000 with which to remodel such schools as might be selected for this work, and this fund is available whenever a plan of procedure mutually agreeable to those involved, has been provided.

John Howatt, chief engineer of the Chicago School Board, told of the plans that had been suggested by Mr. Duffield to conduct a series of investigations on a group of ten schools housing 30,000 pupils. He said that this matter was being held in abeyance while the internal difficulties in the school board were being settled.

Mr. Westover, chief engineer of the Los Angeles School Board, said that his problems were much simpler than those of most men in similar positions. He explained that it was only necessary to open up the boilers for a short period before school time; then the windows were left open during the entire period.

Unit Ventilators in Schools

Describing an unusually complete and elaborate mechanical ventilation plant in the Caledonia High School, East Cleveland, O., W. R. McCornack read only a synopsis of his paper on "First Principles in Unit Ventilation for Schools."

"In Ohio," he said, "there was a statewide complaint about ventilation in public school buildings which became so serious as to lead many school and college authorities to either refuse to operate the equipment or to omit it entirely from the buildings. Call it disregard for the law, if you will, but it is becoming such a potent factor in so many communities that there is now under way and being quietly organized a powerful opposition to mechanical ventilation in schools. This is nationwide and has a very determined force back of it.

After careful study many of the architects in Ohio felt that the code was not only too stringent but that it had become obsolete.

It was proposed to liberalize it. Many makers of ventilating equipment opposed any change, but it is believed that it has been the most constructive bit of legislation with respect to the construction industry ever passed in Ohio. Why should a legislature attempt to fix the point of inlet for fresh air? The new types of ventilation now in use due to this change are meeting with success, and the public is thinking that perhaps there is something to the matter of mechanical ventilation after all.

In the Caledonia school in East Cleveland, O., a unit system of ventilation is in operation which supplies *first*, fresh air without drafts; *second*, temperature regulation which keeps the temperature at the point desired by the medical staff; *third*, there are no odors, and *fourth*, the teaching staff is perfectly satisfied.

Further than this the corridor venting idea has been carried out with excellent results.

In Ohio the code was violated in order to try out the unit system of ventilation which later was adopted and now corridor venting is being tried out in violation of the code and many think this further change should be made in the law.

Mr. McCornack then presented salient figures indicating the extent of the heating and ventilating problem.

The building has a content of 2,700,000 cu. ft., and contains 54 classrooms. general offices, doctors' offices, rest rooms, library, cafeteria, band room, chorus room, kitchen and serving rooms, natatorium with capacity of 60,000 gal., boys' and girls' club rooms, boys' and girls' special exercise rooms, woodworking rooms, boys' and girls' gymnasiums with shower and locker rooms, an auditorium seating 2000 and having a stage large enough for a basketball court.

There are several distinct heating and ventilating systems, the former supplied from two 240 H.P. boilers generating steam at 60 lbs. The greatest interest attaches to the provisions for heating the classrooms. These are each provided with direct radiation and unit heaters. Mr. McCornack described the heating of the classrooms as follows:

These unit heaters in each room together with the radiators are under the control of two thermostats, one controlling the mixing dampers on the heater cabinets and the other controlling the steam valve on the radiator. In the smaller rooms one heater is installed without a radiator adjacent to it. In some of the larger rooms, such as the combination cafeteria and study hall, there are several heaters and several radiators. Their operation is as follows:

The thermostat controlling the mixing dampers of the heater is set up to keep the room temperature within 1° of the 70° limit of the thermostat. If a sudden change occurs in the outside temperature (as it frequently does in the lake cities) causing the temperature to drop to 68° or lower, the second thermostat begins to supply steam to the radiator to keep the temperature up to 70°. The latter thermostat is intermediate in its action, opening the radiator valve gradually and thus avoiding overheating the room.

As a further control on the unit heater, if the temperature should drop to 60° for any reason—such as insufficient steam—the fresh air damper automatically will close and the recirculating dampers will open. Thus the room air will be recirculated to bring up the temperature quickly to 65°, and then the action of the dampers is reversed. This scheme also reduces fuel consumption when heating up the cold building in the morning.

There are two toilet exhaust fans each of 1800 C.F.M. capacity, pulling from boys' and girls' toilet room sections of the building. The woodworking room is provided with an exhaust blower of 4300 C.F.M. piped to the various machines and discharging shaving and sawdust to a collector in the boiler room. Kitchen and serving room quarters are provided with a 5000 C.F.M. exhaust fan with special hoods over ranges, counter tables and dishwashing machine.

Separate ventilating systems are installed for the auditorium and for each gymnasium. An interesting innovation is the placing of the natatorium over the boiler room, the heat from which keeps the water at the desired temperature most of the time, at a considerable saving in fuel.

Mr. McCornack then discussed some

of the details of this installation, showing how certain changes made for better control and operating efficiency. Concluding, he said: "Mechanical ventilation in the school cannot be made to function properly unless there is better co-operation on the part of the architects, engineers, manufacturers and operators of these plants, and not even then will the proper results be obtained until the health authorities come to a decision as to what conditions are necessary in a room to produce the maximum health and comfort."

There followed a discussion on the subject of school ventilation in which E. B. Langenberg told of the great benefits derived from the instructional courses that had been given in St. Louis on proper boiler firing. He said that no small part of the enviable health score in the St. Louis schools had been due to this one factor, and suggested that each chapter take steps to provide for such training of school janitors.

President Anderson said that the report of the special committee to cooperate in the Rochester experiments had been handed to him, with the request that the committee be discharged. He stated that the report was too long for inclusion in the program, that it would be printed in the *Journal*, and that the committee was discharged.

Afternoon Session, January 24

Tuesday afternoon was devoted to a factory heating and ventilating session. Following the report of the secretary, A. V. Hutchinson, in which he showed the society's affairs to be in a satisfactory condition, H. P. Gant, of the York Heating and Ventilating Corporation, presented a paper devoted to a comparison of first costs and operating costs of various types of factory heating systems and unit air-conditioning systems.

What Will the Engineer Choose—Heating Only or Air Conditioning for the Modern Plant?

In his paper Mr. Gant presented a detailed comparison of the construction and operating costs of six primary types of heating systems. In each one direct radiation was used for heating the small rooms. The six systems were:

1. Heating with direct radiation.
2. Heating with suspended type unit heaters.
3. Heating with floor type unit heaters.
4. Humidifying with spray heads and heating with direct radiation.
5. Humidifying and heating with a central air-conditioning system.
6. Humidifying and heating self-contained air conditioning units.

In working out the designs, Mr. Gant had the co-operation of Messrs. R. C. Bolsinger, of the Fowler & Wolf Mfg. Company; Thornton Lewis, of the York Heating and Ventilating Corporation; A. F. Karlson, of the Parks-Cramer Company, and E. T. Murphy and R. R. Taliaferro, of the Carrier Engineering Corporation.

In each case, the building was assumed to be heated to 70° F. in zero weather, with 5 lbs. pressure and gravity return. For the various conditioning systems it was necessary to take into consideration the fact that there will be a connected load of 151 H.P. in motors in the main room as well as 75 employees. It was designed to maintain a relative humidity of 65% in the main room throughout the year.

Cost estimates on all of the heating systems were based on the use of the same boiler plant as designed by Walter H. Wild. This plant consisted of two low-pressure heating boilers, each rated at 83 B.H.P., thus giving a combined capacity of 166 B.H.P. An automatic electric pump and receiver was used to return condensation to the boilers and the plant was designed to use one boiler in moderate weather.

After giving details of the data used in estimating the required radiation, Mr. Gant proceeds to summarize the estimates on the six types of systems contemplated. In the case of direct radiation, the cost of the system was estimated at $17,660 and the operating cost at $4,636. In the case of system No. 2, utilizing unit heaters of the suspended types, the cost of the system was estimated at $16,500 and the operating cost at $4,546. In the case of system No. 3, with floor type unit heaters, the estimated cost came to $13,636 and the operating cost to $3,927.

A separate compilation was made of the construction and operating cost of the air-conditioning systems. The one using spray heads and heating with direct radiation showed a construction cost of $23,155 and an operating cost of $7,657. A central air-conditioning system was figured to cost $24,819 and to have an operating cost of $9,036. A system equipped with self-contained air-conditioning units, it was estimated, would cost $20,416 and would have an operating cost of $7,606.

Much of the discussion turned on the comparative advantages of the central and the unit air-conditioning installations. Mr. Harding expressed the opinion that, when the care of numerous unit air-conditioning elements was considered, the central system should be more economical. Mr. Lyle, in commenting on the arrangement of air discharge from points along one of the walls, declared that, while this might prove satisfactory for heating work, it was extremely difficult to secure uniform humidity conditions in this manner. He said that with the drop in the temperature that inevitably will occur during the movement of the air, there would be a corresponding drop in the moisture content. Mr. Lyle stressed the importance of having a multiplicity of air outlets in order to secure uniform air conditions.

Mr. Carrier pointed out the advantage of having the apparatus in the basement where it could receive proper attention, and advocated the use of concrete ducts as a permanent part of the building construction.

Thornton Lewis mentioned the inducting effects of high-velocity air jets which, he said, acted to secure the necessary diffusion. The return-air velocity, he thought, would be too low to cause drafts with either system.

Other points brought out were that just as high velocities can be used with the central as with the unit systems; that in saw-tooth roof construction it was important not to agitate the heated air in the roof spaces, and that in summer there would be no return of cool air in any event.

John M. Frank of the Ilg Electric and Ventilating Company took up the cudgels for the suspended-type unit heater. In a written discussion he presented a layout for the building assumed by Mr. Gant, comprising 5 instead of 15 units, as were shown in the paper, and gave cost figures of $13,000 for the installation as compared with $16,000 for Mr. Gant's design and an annual operating cost of $3770 as compared with $4546.

In summing up, Mr. Gant stated that his design had been made with the larger number of small units due to the fact that most manufacturers do not make the larger sizes.

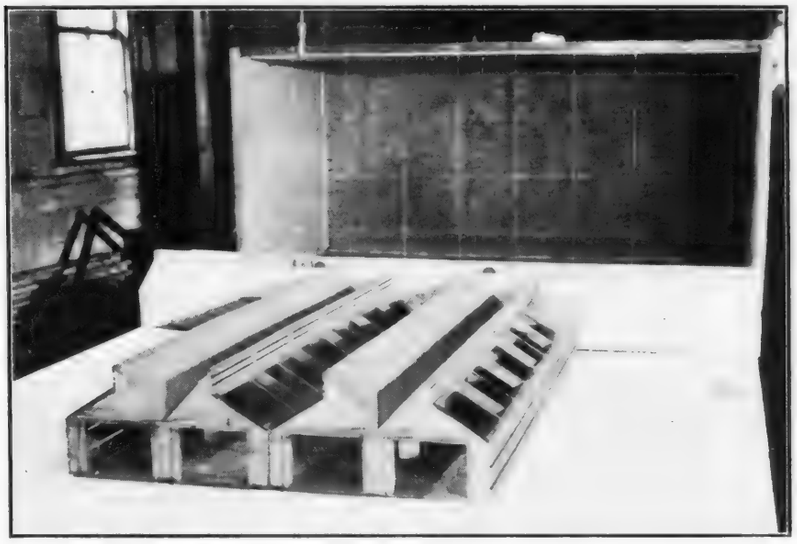
In a telegram of greetings, past-president William H. Driscoll expressed his regret that business had detained him in Chicago so that he could not attend the meeting.

Other papers read at this session were by W. C. Randall on "Aeration of Industrial Buildings" and another by Prof. F. L. Fairbanks on "Natural Ventilation of Farm Buildings."

Aeration of Industrial Buildings

An exhaustive study of the elusive problem of air flow into and out of industrial buildings formed the basis of a paper presented by W. C. Randall, chief engineer, Detroit Steel Products Company. The investigation was carried out by the department of engineering research at the University of Michigan, under the direction of Prof. J. E. Emswiler, and involved, first, a study of available literature on the subject; second, model tests; third, field surveys, and fourth, correlation of model tests and field surveys. The program required three years to complete.

Mr. Randall first discussed the dynamics of the problem, pointing out the tremendous volumes of air that could be moved through a building by natural forces. He developed and analyzed the pressure and suction areas on the surfaces of a building created by the movement of air against the



Model of Factory Building Under Test at University of Michigan to Determine Aeration Factors

building. He then pointed out the factors governing and controlling the flow, inwards or outwards, through window openings, presenting curves, secured in the tests, to substantiate his statements.

After analyzing the factors controlling air flow through building openings, Mr. Randall enunciated these two general requirements: equal window openings, parallel and perpendicular to the longitudinal axis of the building, and windows higher from the floor as they approach the centre longitudinal axis. It may be desirable, on account of the width of the building, to have more than one axis.

Mr. Randall concluded by saying that the major gain, through adoption of the design and other principles laid down were:

"1. There always will be openings, in the lee or jump of the wind, regardless of its direction, which can be opened for outflow, and always windows which are subjected to the pressure effect of the wind, which can be used for inflow openings.

"2. Air can be brought in at almost any desired point, using the pressure effect of the wind, carried through the zone of occupation and out at other convenient points, giving an actual and controlled aeration.

"3. The design lends itself to purely local control of the aeration at certain points, as well as mass control covering large floor areas.

"4. The design lends itself to a wide range of the air movement, ranging from relatively small to extremely large amounts, since the window opening area can be varied within wide limits.

"5. The motive force of the wind, and the head due to temperature difference can be coordinated for effective aeration."

Dairy Stable Ventilation

In a paper entitled "Dairy Stable Ventilation," F. L. Fairbanks, New York State College of Agriculture, Cornell University, first outlined the generally-accepted ventilation methods in vogue and then described a comprehensive study made in a remodeled dairy stable to determine the operation of these systems. The factors thought to be of greatest importance to the proper functioning of a ventilation system were: Number of cubic feet of space in stable, per head of stock; insulation of the stable; height of outlet flue and area of flue.

Mr. Fairbanks described smoke tests made to study the air movement in a stable, and formulated a series of conclusions setting forth the essential requirements. The experimental barn, with capacity for twenty cows then was partially insulated and remodeled according to these requirements, and put under test.

Results of the study are recorded, in detail, in Extension Bulletin No. 151, of the New York State College of Agriculture, and the summary made by Mr. Fairbanks states that the essential factors in dairy stable ventilation are found to be:

"1. A heat reservoir should be maintained in the stable by means of floor outlets if we are to secure temperature control.

"2. Convection currents should be stimulated.

"3. The positive action of these convection currents will give us complete mixing and diffusion of the fresh incoming air, uniform air conditions throughout the stable and will prevent the accumulation of condensed moisture on the walls or ceiling.

"4. The stimulation of the convection currents is assisted materially by locating the intakes on the side walls.

"5. Drafts are avoided by destroying the velocity of the incoming air as it enters the stable, thus making it fall of its own weight through the warm stable-air.

"6. By accomplishing complete mixing of the fresh air and stable air, we are able to locate the outlets wherever it is most convenient to construct them, thus keeping the mow and stable free of obstructions.

"7. No intake should be closer than 6 ft. to an outlet.

"8. From 50 to 60 cu. ft. of air per minute, per head of stock, is sufficient adequately to ventilate and maintain a sweet, dry stable.

"9. These factors apply to both natural-draft systems and mechanical-draft systems such as electric fan outlet systems.

"10. For the electric fan systems, properly designed and located intakes are as important as for the natural-draft systems."

Professor Fairbanks demonstrated the course of air currents with different types of barn ventilation by means of models set up in the meeting room. A feature of his presentation was the use of ammonium chloride in place of smoke to indicate the course of the air currents. These fumes were formed by mixing ammonium hydroxide with hydrochloric acid. Professor Fairbanks said that the fumes were no more obnoxious than smelling salts and for that reason were much to be preferred to smoke bombs in indicating air flow.

Professor Willard spoke enthusiastically of this method of testing, which, he said, he had used with success at the University of Illinois.

Regarding Mr. Randall's paper, both Mr. Vogel, of the General Electric Company, and L. A. Harding testified to the value of the investigation, which made it possible not only to orient buildings so as to take advantage of the maximum prevailing wind currents, but also to correlate the aeration of such buildings with the artificial lighting scheme. Mr. Harding also noted that the tests indicated that the shape of the roof has nothing to do with its aeration, as had been commonly supposed, and he characterized the paper as a pioneer contribution of its kind.

The session concluded with an analysis of the finances of the society presented by Thornton Lewis, chairman of the Finance Committee.

Morning Session, January 25

As nearly half of the aggregate piping used in large buildings is incorporated in the heating system, the paper on "Corrosion in Steam Heating Systems," by F. N. Speller, metallurgical engineer, National Tube Company, received unusual attention.

Corrosion in Steam Heating Systems

Mr. Speller said, in part:

"The corrosion of steam-heating systems is associated mainly with certain types of boiler feed-water and, therefore, varies widely in different localities, depending upon the composition and quan-

tity of non-condensable gases evolved with the steam. The harmful gases are oxygen and carbon dioxide. Sometimes serious corrosion is caused by abnormal leakage of air into the system.

"The problem of steam-pipe corrosion includes three essential factors—moisture, oxygen and carbon dioxide—the latter apparently being in most cases the chief accelerator of corrosion in return lines. Carbon dioxide at 60° C. (140° F.) and atmospheric pressure, is nearly one hundred times as soluble in water as oxygen, and therefore is readily taken up by the condensate. Furthermore, the ferrous bicarbonate formed will be decomposed, in the boiler, releasing the CO_2 gas again, so that a small amount of carbon dioxide may travel around the system repeatedly, and eventually do considerable damage. The action of the acid in the absence of oxygen is relatively slight, so that every reasonable precaution should be taken to exclude air from the system, but, of course, this is not entirely practicable in steam-heating systems, especially when they operate under a vacuum.

"The difference in deterioration of steam systems of the same type in different localities is often due to the variable acidity of the condensate and this is a matter that can be regulated to a large extent by the use of a suitable system of boiler water treatment. Steam return lines in New York City buildings using Catskill water, for example, suffer much less than similar systems in Los Angeles, where the water carries the same oxygen but over ten times the amount of active carbon dioxide as that present in New York water."

Summarizing the results of his experience, Mr. Speller said:

"1. Corrosion in steam-heating systems is confined mainly to the returns, and varies widely in different localities and sometimes in the same locality, due to variations in the water and in operating conditions.

"2. There does not seem to be any necessity to use a more costly material for piping than wrought-iron or steel, between which long experience indicates no material difference in durability when used for this purpose.

"3. The amount of dissolved oxygen and carbon dioxide present determines the extent of corrosion. The carbon dioxide should be low, especially when any considerable amount of oxygen is present.

"4. The carbon dioxide in the condensate comes mostly from the dissociation of bicarbonates or carbonates in the boiler. For this reason sodium carbonate should not be used for internal treatment of water in heating boilers.

"5. In high-pressure plants the water should be pre-treated to remove free and half-bound CO_2 and scale-forming matter without leaving more than a slight excess of sodium carbonate. The water should be thoroughly deaerated before entering the boiler.

"6. In low-pressure steam boilers (less than 5 lbs. pressure), where corrosion occurs in the returns, an excess of caustic soda with an equal amount of sodium sulphate should be maintained in the boiler water. The hydroxyl alkalinity should be at least twice the carbonate alkalinity. This can be controlled by testing samples of boiler water and the condensate.

"7. All returns should be sealed, and every precaution taken to prevent unnecessary leakage of air into the system. Oiling the steam will afford substantial protection to steam piping."

Mr. Speller told how the use of zinc dust, in over 100,000 miles of pipe line, had almost eliminated corrosion, and suggested that steam pipe-fitters might profit by this experience.

A lively discussion indicated the interest in the subject, and a question by Homer Linn as to the proper use of oil, as recommended by Mr. Speller, brought out the information, from the latter, that piping in buildings in New York using engine exhaust containing an appreciable quantity of oil, had passed through 15 years of use without showing signs of corrosion.

Preliminary Boiler Tests in Kentucky Laboratory

A timely paper, in view of the presentation of the report of the Committee on Rating Low-Pressure Boilers, was prepared by L. S. O'Bannon, professor of heat engineering, University of Kentucky. This was based on tests made in the thermal laboratory at the university, and was designed to throw light on the questions at issue in the boiler-rating code controversy.

The chief topic of the paper was a comparison of test method A and test method B, alternative methods for measuring the quantity of steam delivered by the boiler. Test method A measures the output of the boiler delivering the steam to a condenser and weighing the condensate. Test method B measures the water fed into the boiler and requires the boiler water-level to be the same at the end of the test as at the beginning.

After describing the equipment used in making the tests, Professor O'Bannon discussed, in detail, procedure in determining the relative accuracy of the two suggested methods of measuring steam delivered by the boiler. While the two methods seemed to produce nearly identical results, valuable information on test technique was developed.

In regard to the question of limiting moisture content in the steam, Professor O'Bannon said:

"The boiler used in these tests delivers steam with less than 0.5% moisture at all rates of evaporation up to the priming point. The percentage of moisture was obtained from the gross weight of water collected in the separator with no corrections for radiation or separator efficiency.

"Using the automatic boiler feeder, which allows the water level in the boiler to fall below the normal water line with increasing evaporation, the boiler started to prime when the flue-gas temperature reached 1200° F., corresponding to an evaporation of approximately 1300 lbs. per hour.

"The 2% moisture limitation specified in the code is desirable since it specifies a reasonable limit to the moisture content of wet steam. Also it may be a fact of general experience that boilers must prime in order to deliver steam with a moisture content exceeding 2%. Again, if priming means the delivery of wet steam with a certain quality, then priming may be defined in terms of an arbitrary percentage value.

"On the other hand, if priming is the carrying over of entrained moisture in a more or less violent manner, in intermittent, disconnected slugs and chugs, then let priming be defined in such homely language, and be recorded simply as a matter of fact as indicated by rapid accumulation of water in the separator.

"It is the opinion of the writer that the 2% moisture specification should stand as a limitation to the quality of wet steam; and since it should be required that the boiler be operated below the priming point during any test, it is sufficient to know when priming occurs without adding confusion or misconception by attempting to define priming in mathematical terms."

Professor O'Bannon approved the recommendation of the committee that tests be of such length that they can be completed in an eight-hour working day, and said that in efficiency tests the greatest source of error is in estimating the thickness of the fuel bed at the beginning and end of the test. He presented a table showing that, to insure a maximum error of 2% on test results, the error in estimating fuel-bed thickness should not be more than 0.41 in. for an eight-hour test, or 1.19 in. for a 24-hour test.

F. C. Houghten, opening the discussion, pointed out the value of college laboratories for co-operative research, as exemplified by the large amount of valuable data secured in this hastily conducted test. "The findings of Professor O'Bannon," he said, "have cleared up some disputed points and set the rating code committee straight."

R. V. Frost and C. E. Bronson asked for light on details of the test equipment and Professor O'Bannon supplied the desired information.

Output-Operating Characteristics of Low-Pressure Boilers

In order that a comprehensive understanding of the principles of boiler operation might be arrived at by those interested in the boiler rating code, the U. S. Bureau of Mines undertook to carry out certain tests to develop the necessary data.

A vivid presentation by Percy Nicholls established several facts that apparently have not been generally understood, and the paper is a valuable contribution to the problem in hand.

Mr. Nicholls first described the equipment and set-up for running these tests on a horizontal sectional cast-iron boiler having 32.5 sq. ft. of grate area and on a round sectional boiler having 3.14 sq. ft. of grate area. The test was conducted as a continuous boiler run, with observations made to get instantaneous values, or values for short periods of 5 to 15 minutes, during which time combustion conditions were maintained constant. The graphs submitted with the paper made many of the deductions clear and the conclusions drawn from the tests by Mr. Nicholls were as follows:

"1. For a given fuel and for similar firing and attention condition, the plot of smokehood temperature against rate of output gave a straight line which intersected the temperature axis for the boilers tested at 150° F. for the large, and 180° F. for the small boiler.

"2. The general truth of this relationship is well confirmed by performance curves of other boilers and it is suggested that a line drawn through the test point at a high rate of output and 175° F. on the temperature axis expresses the relationship sufficiently accurately for practical purposes.

"3. With a constant stack temperature and similar fuel-bed conditions the rate of output showed no great difference between that with high and that with low per cent CO_2 in the flue gas, and the ratio may be greater or less than unity depending on the type of boiler and method of operation.

"4. The stack draft required for a given rate of output increased rapidly with decreasing per cent CO_2 in the flue gas, and the draft measurements obtained in these tests approximated to the theoretical formula—draft varies inversely as $(CO_2)^{1.8}$.

"5. With zero ashpit draft and similar fuel-bed conditions the stack draft varied as $(\text{output})^n$, where n was 2.3 for the small, and 2.6 for the large boiler."

S. R. Lewis called the attention of the members to the liberality of the U. S. Bureau of Mines in providing for the tests described by Mr. Nicholls, solely to aid the rating code committee in carrying on its work.

Boiler Rating Code Committee Asks for Time

The long-anticipated report of the Committee on Rating Low-Pressure Heating Boilers was made by Alfred Kellogg, chairman. He first stated that the elapsed time since the White Sulphur Springs meeting, at which the code, in its preliminary form, had been "adopted as to principle," had not been sufficient to permit the committee to carry its work to conclusion, and said that it was considered advisable to delay the formal report until the next semi-annual meeting.

Mr. Kellog recounted the progress made in dealing with interested associations, organizations and individuals. He told of conferences with a committee of the Heating and Piping Contractors National Association, and of the probability of complete agreement between this organization and the society. He then told of contacts with a committee from the American Boiler Manufacturers Association, of early failures to reach a common understanding of the principles involved, and of later conferences out of which grew a visualization of the possible need for a more comprehensive boiler-rating code, involving such apparently extraneous considerations as chimney action, with its influence on boiler performance.

As a result of the enlargement of the scope of this subject, Mr. Kellogg offered a synopsis of the suggested amplified code, in which the high lights of the expanded problem were set forth. He stated that the committee had not finally formulated this enlarged code, as it recognizes that there are a number of debatable items.

In brief, Mr. Kellogg outlined the attitude of the committee in regard to the code, as it now stands, as follows:

"The principles of the enlarged code which the committee has drawn up to serve as a basis for discussion are shown by the extracts from it which are appended to this report. The committee has not adopted it and knows that there are a number of its suggestions which are debatable.

"The main objective underlying the proposal is to so closely specify and to control the testing that manufacturers may have equal opportunity to obtain results, and that these may legitimately be comparable with results obtained by others; also to call for the minimum number of tests involving the minimum cost to the manufacturers and yet will give all the necessary data required for catalogs.

"It is to be understood that these proposals will not debar the manufacturer from making the full number of tests necessary to plot a complete performance chart should he so desire, but they necessarily assume that manufacturers' catalogs will all give the data obtained by the tests.

"Objections have been raised to stating efficiency in any form, this objection being based on the well-known discrepancies which result when the same boiler is tested by different crews. The committee believes that this is largely due to the fact that while test specifications have controlled the way test data are to be measured, yet they have not sufficiently controlled the firing, the damper regulation and the general conduct of the test.

"The need for, or usefulness of, a priming test also has been questioned, and as an alternative, it has been suggested that the output—as measured by smokehood temperature—should be increased to a fixed per cent above that of the rated output, and that no serious priming shall occur. There is very little published data on priming, and no established agreement among manufacturers as to what is meant by the water line of a boiler.

"In conclusion the committee would urge that the manufacturers recognize that the drawing up of this code is an engineering task and that they should give their engineers full freedom to so discuss and consider it. The sales and commercial questions that are involved can be considered after engineering features have been settled."

After presenting his report, Mr. Kellogg expressed his opinion that the rating code should be supplemented with a chimney code and a code for the selection of boilers for any given service. Following a brief discussion on this point, W. T. Jones placed the following motion before the meeting:

CODE COMMITTEE PERSONNEL AND SCOPE ENLARGED

"Moved that the progress report of the Committee on Rating Low-Pressure Boilers be accepted; that the committee be made permanent and that its title and scope be enlarged to cover the selection of boilers, as well as their rating. Also that the committee be empowered to enlarge its membership, if desired, and to select such new members."

This proposal was seconded by E. A. May, and brought on a spirited discussion, led by Stewart A. Jellett, and R. V. Frost. Replying to statements that the inertia in the manufacturers' associations mentioned in the report did not exist as a force counter to the ideas of the committee, Mr. Kellogg stated that, "Were it not for the commercial factors in this problem, the matter could be settled in 20 minutes."

President Anderson asked for expressions from representatives of these manufacturers' associations, and Homer Addams, chairman of the steel heating boiler section of the American Boiler Manufacturers' Association, pointed out the long path up which these manufacturers had passed to attain their present position. He said that the inertia previously mentioned was that of consistent progress, and not in any sense in opposition to the aims of the committee, and that he felt certain the association would co-operate with the committee in every possible way.

H. M. Hart, said that the Heating and Piping Contractors Association had spent several years trying to attain a satisfactory boiler selection code, and that it deliberately had avoided the term "rating." He said that it had succeeded in getting the manufacturer to supply the contractor with sufficient data so that he could picture the performance of the boiler and, knowing the conditions of installation, make a proper

selection. "I believe that a chart showing full performance of a boiler is better than a single figure standing as a rating," said Mr. Hart, "but I am in favor of the motion, and know that the heating contractors will co-operate with this committee."

Mr. Nicholls asked for the floor to outline a plan of the committee for holding an open session on this subject, to which engineers of all the boiler manufacturers will be invited for a full discussion of the code from a technical standpoint. With the data already in hand, and that brought out at this meeting, the committee hopes to be able to draw up a code in semi-final form for submission to the manufacturers' associations after which it will be presented for final adoption.

As this subject was not in line with the motion, it was laid over until a later session, and the motion was unanimously passed. The session then adjourned.

Afternoon Session, Jan. 25

Wednesday afternoon session opened with the presentation of a paper by Charles S. Sage on "Extended Surface Radiation."

An analytical study of the value of non-ferrous extended heating surfaces formed the basis of the paper presented by Mr. Sage.

Standard Test Code for Heat Transmission Through Walls

A number of important revisions were made in the proposed test code for heat transmission through walls, which was first presented in a tentative form at last summer's meeting of the A.S.H. & V.E. and published in THE HEATING AND VENTILATING MAGAZINE for November, 1927.

As is pointed out in the preface of the code, in order to obtain complete information on heat transmission through building walls, two classes of tests must be considered, either one or both of which may become necessary or advisable, depending on the purpose in view.

(1) Tests on the conductivity of homogeneous materials must be run in order to determine the fundamental constants which constitute the basis for the calculation of the overall heat transmission through built-up walls.

(2) Tests on the overall heat transmission through actual built-up walls may be run to serve as a check on the validity of calculated values, or to establish these values in cases where the nature of the constructions does not permit accurate calculations being made. Separate sections of the code, therefore, have been devoted to these two classes of tests.

After presenting the definitions and the formulas used, it is noted that the guarded hot plate is to be the standard method for determining the conductivity of homogeneous materials, although it is pointed out that this method is not applicable to the determination of overall heat transmission coefficients.

In determining the conductivity of homogenous material it is specified that the test specimen shall be 1 ft. x 1 ft. and that plates must be applied in such a manner that the density and other physical characteristics of the material under test is not altered. It is further specified that in order to make the results from different laboratories comparable, the standard method of making tests shall be at a mean temperature of 60° F. and upon dry material. In the revised draft it is further noted that the coefficients of conductivity as determined by the methods outlined in the code shall not be regarded as the standard coefficients of conductivity.

In determining the overall heat transmission, the code requires that:

(1) The test specimens shall be constructed similarly to actual walls, and not consist merely of plates of the separate materials forming the walls. Such wall specimens shall be constructed to conform to the standard specifications of the manufacturers of the products used, and according to the usual practice of the trade employing average skilled labor.

(2) The portion of the specimen through which the flow of heat is actually measured shall be at least 3 ft. x 3 ft.

Instead of designating the Nichols heat meter as an alternate method of testing, the revised code merely refers to it as offering a convenient method of consideration for testing actual walls. Since methods for the use of the meter for determining fundamental constants for structural materials have not been well developed, concludes the report, its use as a standard method cannot be adopted at the present date, but since the meter appears to give promise of advantage in making such determinations, it seems well to recognize such possibilities and to recommend that an extensive study be made of its application for the purpose of standardizing its use.

Utility Demands of a Modern Hospital

In a paper presented by G. L. Larson, professor of steam and gas engineering, University of Wisconsin, and two of his associates, Prof. D. W. Nelson and Prof. R. A. Rose, is embodied a description of, and results obtained from, a test covering 16 months made on the Wisconsin General Hospital Building, Madison, Wis., to determine the requirements of water and steam for various purposes.

This hospital was erected at a cost of well over a million dollars, is six stories in height, and contains over 300 beds, nearly all of which are occupied at all times.

After describing provisions made for ventilation, heating, water softeners, and refrigeration, Prof. Larson outlined the methods of determining quantitatively the requirements, both on a per diem basis, and on the basis of per patient per day. The tabulation of results and the graphs presented probably constitute as accurate empirical data on this subject as are available.

The remainder of the session was devoted to building insulation, two papers being presented on this subject, one being by E. N. Sanbern on "Value of Building Insulation to Reduce Heat Losses," and the other by M. S. Wunderlich, of the Flax-li-num Insulating Company, on "Economic Thickness of Insulation for Building Walls."

When Should Building Insulation be Used?

In an interesting dollars-and-cents analysis, Mr. Sanbern set forth a method of determining under what conditions insulation could be applied to a building and be justified by the saving effected in annual operating cost.

To give concrete form to the problem, Mr. Sanbern considered three hypothetical buildings, all with 13-in. brick walls, with lath and plaster interior finish, one with no insulation, one with a layer of ½-in. insulation used as a plaster base, and a third with two such layers of insulation. He then computed the heat loss per square foot of wall, the radiation necessary to supply this loss and the fuel required to supply heat for this radiation, assuming the buildings to be in Philadelphia.

He first tabulated the results of his computations on the basis of fuel costing $7.50 per ton; then with $15 fuel. In each case the sum of the elements representing annual operating cost varied from a high cost to a low cost and on to a higher cost, showing that the sum of the interest on the building investment, the depreciation and the fuel cost was a minimum for a certain amount of insulation, and that, where more insulation was used, the interest on its cost plus the depreciation was greater than the cost of the excess fuel burned.

In like fashion Mr. Sanbern presented a series of computations to determine the economical amount of insulation that should be applied to a typical roof under specific unit costs. He particularly enjoined his hearers from considering his suggestion as more than a method of figuring, and said that each case should be taken on its merits, the cost of radiation, cost of fuel, depreciation on heating system, rate of interest on investment and cost of building being taken to conform to local conditions.

The Economic Thickness of Building Insulation

Utilizing a mathematical method of determining cost graphs, M. S. Wunderlich, mechanical engineer, Flax-li-num Insulating Company, presented these graphs as a ready and accurate method

of determining the best thickness of insulation under any conditions of service. "The factors," he said, "are the cost of fuel, the seasonal demand, expressed in degree-days and the cost of insulation installed."

Taking, as an example, conditions in Chicago, he finds, with the average cost of fuel to the home owner, that the ratio of ½-in. insulation on the side walls to 1-in. insulation on the ceiling is a well-balanced plan.

Thursday Morning, January 26

In presenting the report of the Guide Committee, Perry West sketched the beginnings and growth of the *Guide*, particularly emphasizing the parts played by J. E. Bolling, whom he characterized as the "father of the *Guide*," Secretary A. V. Hutchinson, who has been the co-ordinating force, W. H. Driscoll and C. V. Haynes. Mr. West gave some interesting figures relative to the financial status of the *Guide*, showing a gross revenue, for the last year, of more than $30,000, and a profit on the order of $10,000.

While Mr. West characterized the *Guide* as a standard book of reference in the heating industry and among architects, he said that there is room for improvement; for the inclusion of the various codes of the society; the revision of many of the existing chapters and for the insertion of chapters dealing with new subjects. He recommended that, in carrying on this important undertaking, a sort of consulting board be established from the older membership, including those who have built up the *Guide;* also the formation of the next *Guide* committee from the younger members, giving them opportunity to do useful work for the society.

Mr. Issertell paid a glowing tribute to Mr. West, as did Thornton Lewis and H. M. Hart, who said that few of the users of the *Guide* had any appreciation of the work involved in its preparation.

E. K. Campbell reported for the Committee on Garage Ventilation, sketching the history of the movement that resulted in the formation, by the National Fire Protection Association, of a national committee. For the committee, Mr. Campbell recommended to the council that the society become a member of the N. F. P. A., largely for the purpose of co-operation with that organization in matters of mutual interest and concern.

Mr. Campbell pointed out that the preliminary report of the committee, made at the White Sulphur Springs meeting, had as its basis the prevention of recirculation, while the present committee has based its code on the necessity for definite air movement, in order that dangerous gas pockets might not be formed. He said that a meeting of the national committee would be held in Chicago, in February, at which engineers from the Underwriters Laboratories would be present, and at which time it was expected that the code could be drafted in final form, for presentation at the summer meeting. The report was accepted as a progress report.

F. C. Houghten read by title, a paper "Saving Heat in Skyscrapers," and G. B. Nichols praised the paper for its timeliness and said that more studies should be made on tall buildings, particularly in regard to the neutral zone and the variation in radiation on the different floors.

STORY OF THE HUDSON TUNNEL

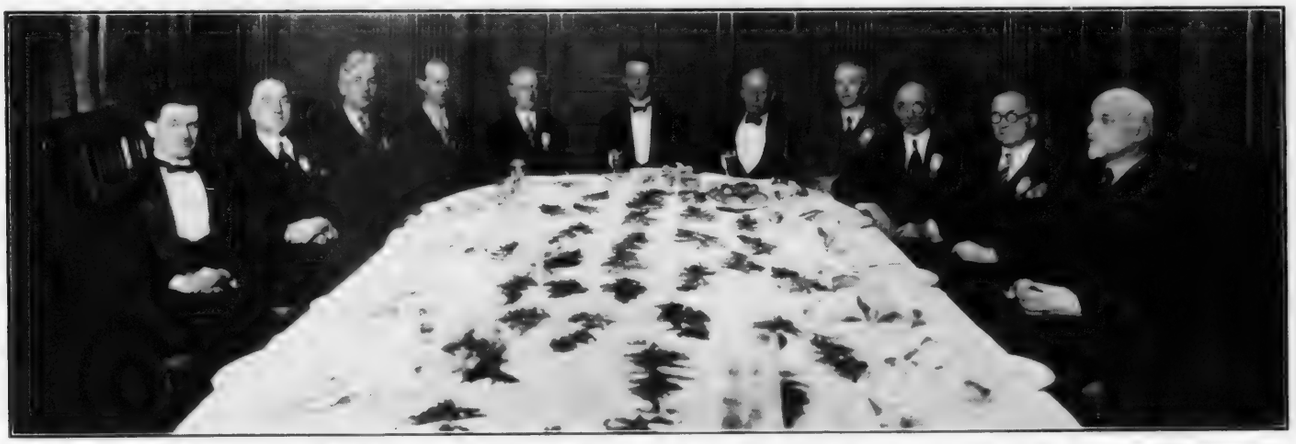
The feature of the final session was a talk, by Ole Singstad, chief engineer of the New York and New Jersey Tunnel Commissions. Mr. Singstad was designing engineer, during the régime of Clifford M. Holland and Milton H. Freeman, as chief engineers, both of whom gave their lives to the tunnel. Since the death of Mr. Freeman, Mr. Singstad has been chief engineer.

Mr. Singstad outlined the conception of the project of a bridge across the Hudson River, the early periods of study, the decision, in 1913, that a bridge would be impracticable, the six years of study and preparation for tunnel construction, the actual building of the tubes and the operating characteristics of the tunnel in actual use. He told of the extensive studies at Yale, at the U. S. Bureau of Mines, and at the University of Illinois, from which data were derived upon which to base the design of the ventilating system and equipment. The standard of air pollution from CO, as determined from physiological tests at Yale, was set at a maximum of 4 parts in 10,000. The studies at Illinois were devoted to a determination of power requirements for air movement, and involved the construction of a ½-scale model tunnel, 300 ft. long, with elaborate instrument and power equipment. The studies by the Bureau of Mines were to determine the CO output of various types and sizes of automobiles. The preliminary investigation was followed by one made in a tunnel reconstructed in an old mine tunnel, in which the preliminary data were checked.

Mr. Singstad then told, in a vivid way, of the actual construction work, illustrating his talk with lantern slides. He then turned to the actual operation of the tunnel and gave some vital statistics to show how actual conditions varied from those computed in advance of construction. He said that one and one-half million cars have used the tunnel, 46,000 in a single day, during which the atmospheric conditions were found to be better than on many New York streets.

Mr. Singstad said that it was interesting to see how closely the quantity of air supplied to each section of the tunnel approached the quantity computed as the result of the tests at Illinois. He gave the following figures, for the seven different sections, representing actual air supplied in per cent of computed air supply:

7½	per cent excess
4	per cent excess
1	per cent less
3½	per cent excess
5	per cent excess
2	per cent less
½	per cent less



Eleven Past Presidents of the American Society of Heating and Ventilating Engineers Meet for Annual Dinner, January 23, 1928

(Left to right) Prof. Samuel E. Dibble, Harry M. Hart, J. Irvine Lyle, Dwight D. Kimball, John F. Hale, H. P. Gant, Stewart A. Jellett, Samuel R. Lewis, Jay R. McColl, Walter S. Timmis, and Homer Addams

Thirty-fourth Annual Dinner, American Society of Heating and Ventilating Engineers, Hotel Pennsylvania, New York, January 24, 1928

New Institute Thermal Research, American Radiator Company, Yonkers, N. Y.

The adjoining building is the old laboratory and the detached building in the rear is the research residence.

Concluding, Mr. Singstad said that the tunnel had lived up to the expectations of the engineers in every detail of the ventilation equipment and operation.

Reporting for the Membership Committee, C. V. Haynes gave index figures to show the growth of the society. There was, on January 1, a total of 1958 members, associates and juniors.

The proposed amendment to the by-laws relating to the qualification of members was passed.

John F. Hale, the dean of past-presidents, was asked to present the incoming officers, which he did with graceful references to the outstanding characteristics of each individual. President Anderson, greeting Professor Willard, presented to him the gavel of the society, with a charming little speech of tribute, welcomed the other officers and new members of the council, and terminated his very able executiveship of the society.

COINCIDENT HEATING AND VENTILATION EXHIBITION TO FEATURE 1930 ANNUAL MEETING

R. E. Jones, representing the Philadelphia Chapter, extended to the society an invitation to meet in Philadelphia in January, 1930, at which time it is planned to hold a heating and ventilation exposition in conjunction with the annual meeting. President Willard said that the matter would be brought to the attention of the council for consideration.

Dean Anderson expressed his appreciation for the services rendered to the society by A. V. Hutchinson and said that his able handling of the society affairs justified a change in title from secretary to general manager. It was the sense of the meeting that the tribute was well deserved, that some such action was warranted, and that this matter also be referred to the council, with power to act.

The meeting then adjourned *sine die*.

Benjamin Franklin Honored at Annual Dinner

Benjamin Franklin and his achievements as a pioneer in heating and ventilation was the principal theme at the annual dinner of the society held at the Hotel Pennsylvania, Tuesday evening, January 24. The speaker was A. O. Stanley, ex-governor and former senator of Kentucky, who presented a vivid picture of conditions in Franklin's time and of his brilliant achievements both as a statesman and inventor.

President R. A. Wolff, of the New York Chapter acted as toastmaster, and the presentation of the past-president's emblem to the retiring president, Dean Anderson, was entrusted to J. I. Lyle.

Mr. Wolff then presented Prof. A. C. Willard, the incoming president. Professor Willard responded in a happy vein and commented on the unanimity with which the society is working to advance the interests of heating and ventilation.

Meeting of Nominating Committee

A meeting of the Nominating Committee of the society, held at the Hotel Pennsylvania, was attended by E. K. Campbell, chairman; O. K. Dyer, E. C. Evans, A. S. Armagnac, Norman W. Calvert, H. M. Miller, Davis S. Boyden and E. B. Langenberg.

Inauguration of Institute Thermal Research

Thursday's visit of the heating engineers to the Institute Thermal Research of the American Radiator Company, at Yonkers, N. Y., was made the occasion of the formal opening of the institute. On arrival at Mount Vernon, the guests, numbering 150, were taken in buses to the institute where they were met by Dr. Charles W. Brabbée, director Institute Thermal Research.

Tables were set for a buffet luncheon. At its conclusion Prof. A. C. Willard, the new president of the A. S. H. & V. E., addressed the gathering expressing the interest of all connected with the industry in the research work undertaken at the institute. He was followed by Dr. Brabbée, who gave details of the institute's equipment and program.

The party was then divided into groups of 20 each and assigned to aides, who took them first through the original laboratory, thence to the company's research residence at the rear and back to the main testing room. There the party saw the firing of two boilers with soft coal, one of the smokeless up-draft type, and the other, of the hard-coal burning type.

As these boilers were being fired, Dr. Brabbée invited those interested to step outdoors and watch the smoke stack to see the difference in the emission of smoke. In the case of the smokeless boiler, the smoke emitted was noticeably light, while, with the other boiler, a cloud of black smoke issued from the chimney for some time.

Those particularly interested in gas heating were taken over to the plant of the Consolidated Gas Company where they saw a battery of large gas heating boilers in operation.

Health and Ventilation

By Peter H. Bryce, M. D.

6. The Dust of the Outer Atmosphere in Relation to Health

THE history of the past, as well as what we learn to-day, tells of the simoons, siroccos and other hot winds, blowing across great parched areas of sand, engulfing even whole caravans and stifling men and animals with the heated particles of dust and alkali; also of chilling mistrals, blowing across mountain plateaus and bearing cutting particles from the flinty hillsides, to the great distress of men and animals. The writer recalls crossing the Nevada desert one October day, some years ago, in a Pullman, which had all its windows, doors and ventilators tightly closed, thus vainly trying to keep out the fine alkaline dust. Had it not happened that a hot-box forced the train men to stop every hour or two to cool the axle, thereby enabling the passengers to breathe some fresh air, the eight hours across that desert might have had a serious ending.

Last summer some friends invited me to dine at the Chateau Laurier and later sit on the piazza and enjoy the music of the carillon, installed in the nearby tower of the Parliament Building. No fairer, or more enchanting, view can be found than that from this hotel piazza. Beyond, the blue hills of the Laurentians lay to the northwest, and the summer sun just setting had left the heavens reflecting its glorious rays, shading from deep red to purple, with delicate silver fringes. The scene thus presented beyond the Ottawa was one of perfect calm; but the demons of modern industry were present to warn us that we were still on the earth. The first was the rumbling of the street cars and the noise of shunting engines beyond the railway station, pouring out their dense volumes of smoke, and the other a subtler and more disagreeable thing, the sulphur dioxide fumes, blowing eastward from the great pulp-mills at the Chaudiere, so irritating to the mucous membrane of the throat and nose.

CHLORINE FUMES FROM THE ROYAL MINT IN OTTAWA

I frequently go to the Archives Building to make researches, and alongside of it, on the bank of the Ottawa, is another massive building, the Royal Mint. In one are many thousands of precious old documents and in the other are minted millions of gold coins for the British government—as many as 240,000 oz. daily during the war. The mint, with its complex and delicate machinery, has to refine the gold to remove the dross, and to do this adds hydrochloric acid to the fused metal in the retorts. Twenty-one modern oil furnaces are to be seen in this building, where temperatures over 3000° F. are reached, and yet in the crudest manner the chlorine fumes are poured out direct from a tower toward the open windows of the Archives, not a hundred yards away. What the acid fumes will do to the precious volumes of manuscripts may be imagined; but their disintegrating effects will be certain soon.

I have given these several rather unique illustrations to show that, with all our wonderful advances in applied science, we are still crude at the very point where our progress should be greatest, namely, in the means for insuring the health and comfort of the community.

In the matter of chlorine fumes, we can recall their recent use in the great war as poison gas; but I remember the account of the first steps taken to protect the public, as well as the vegetation around the industrial towns of England fifty-five years ago, when the salt and alkali works were located there.

Dr. Angus Smith, the official chemist, found that an excessive amount of chlorine fumes was being allowed to escape from the works, and so, after experimenting, ordered the manufacturers to install a series of lead-lined chambers in which trays of quick-lime were placed. The chlorine fumes then were passed through these in succession until, at the exit, the amount of chlorine was reduced to a minimum. Of course, the manufacturers at first strongly protested against the cost of installation, but soon found they had produced a new by-product, bleaching-powder, which is to-day universal in its many applications and makes a steady profit for them.

SMOKE AS A NUISANCE, AS WELL AS AN IRRITANT

Of course, to the man in the street now, with our asphalted streets and daily washing, and motors instead of horses, the smoke from thousands of chimneys is our most apparent nuisance. Fortunately, it is not directly poisonous, but may act as an irritant to the mucous membrane and actually creates what in miners is called *anthracosis*, a dark staining of the tissues. It must impede the free healthy action of the tissue cells which line the alveoli of the lungs. But smoke is equally a nuisance, entering houses and covering with dust all objects, soiling curtains and carpets and creating an expensive item in the increased cost of washing clothes. To lessen or obviate these conditions, smoke abatement laws have been passed; but almost no city council has had the nerve actually to force the adoption of means available to-day to eliminate the nuisance. Undoubtedly, the first step is to force the railways to enter the great terminal cities with electric engines, and later to electrify their whole systems by transmuting the coal at regular stations into electric energy and transmitting this along the lines.

POISONOUS FUMES OFTEN A VALUABLE BY-PRODUCT

It would be easy to estimate the saving in so important a matter as clean clothing and reduced house-cleaning from an abatement of the soft-coal nuisance, and doubtless the time may not be far distant when the force of public opinion will cause the introduction of such means as will effect real improvements. In those industrial works from which poisonous emanations, such as chlorine and sulphur dioxide, are discharged into the air, there is no logical reason why fans, creating a forced draft, should not replace tall chimneys, and the fumes be carried through chambers in which trays of quick-lime may be placed to form useful compounds such as chloride of lime and calcium sulphite. At the copper mines in Boise City a long flue with doors on the sides, where it runs nearly horizontally, has been constructed, running at an incline up the mountain-side. The gases from the furnaces gradually are cooled and deposits of sulphur and arsenic are collected for use and the poisonous gases lessened in the outer air. Other methods are being adopted at the great Sudbury Nickel smelters and everywhere the sale of by-products helps to replace the cost of installation.

AUTOMOBILE GASES PRESENT PRESSING PROBLEM

But to revert to urban aerial nuisances, undoubtedly the most prevalent to-day is that caused by the fumes and gases from automobiles. Doctor Henderson, of New York, has made experiments to prove the noxious effects of these upon the individual, due to the excessive carbon monoxide given off from the thousands of motors, near the ground, on the level with the air breathed by hundreds of thousands of persons. The high buildings and narrow streets confine the air, and it is

quite likely that policemen exposed for hours in the traffic line must suffer from these gases. What carbon monoxide does is seen in the almost daily reports of deaths from it in garages and even closed cars, and the public will suffer until intelligent means are adopted for lessening the dangers. Only the fact that great volumes of air are driven through the streets by the wind minimizes the dangers from this source. The necessity for a knowledge of ventilation is yet more obvious when we learn that there is at least one motor car for every ten people in the United States, and the number of garages built without any regard for air circulation is constantly being increased.

CHICAGO'S AND KANSAS CITY'S PROBLEMS IN CONNECTION WITH THE STOCK-YARDS

An aerial nuisance of the most aggressive sort has long existed in such cities as Chicago and Kansas City in the form of emanations from the immense stock-yards and packing-houses. In this case, too, there are particles carried into the air of dry organic matter and volatile compounds from the putrefaction of animal fragments of manure and particles of animal tissues. While much has been done to lessen these nuisances by making smooth paving in stock-yards and abattoirs, which can be flushed, and by white-wash applied to the surfaces of walls indoors as a disinfectant, yet to the visitor to Chicago, the low hanging damp air in the evening blowing from the stock-yards has a most depressing effect. Closed windows lessen for the moment, the odors, but the decomposition of organic animal particles in the rooms of houses and the oxidation of volatile emanations from the stock-yards create those stuffy smells which closed parlors have and, as we have seen, tend to produce such asthmatic attacks as were noted in a preceding article.

THE HAZARDS OF STONE CUTTING

Another external as well as internal air impurity, which has been noted from early times, is that associated with the cutting of stone—especially granite and sandstone. One can imagine it to have been a very serious trouble in European countries when the houses were generally built of cut stone and great cathedrals were building for years. The sharp particles of rock broken off, whether by hammers, chisels or in steel grinding and metal polishing, are inhaled and the fine particles reach the lungs. Where men have worked for months and years, these particles produce a condition known as *silicosis* from the silica or sharp sand particles which are chiefly responsible for the condition.

Professor Haldane ascribes the disease, chiefly to these angular fragments of rock adhering to the mucous lining of the lungs and setting up a congestion around them, which produces gradually tissue changes into what is spoken of as a fibrosis or connective tissue, replacing lung tissue, as may be easily demonstrated by the skiagraph.

Fortunately, the tissues, both in man and experimental animals, tend to cast out these particles by an excessive mucous secretion; but in man it is found that the disease of *silicosis* has three distinct stages. The *first* is seen in the beginning of physical changes, as indicated by increased shadows in the skiagraph; the *second* is where the tissue changes have progressed till the capacity for work has become impaired, when the patient suffers from definite shortness of breath on exertion and, at times, darting pains in the chest with a morning cough and a frequent recurrence of colds. The *third* stage means a distressing shortness of breath, cough with increased expectoration, increased fibrosis of the lungs, loss of weight, generally associated with chronic tuberculosis.

The picture is clear in its outlines and the writer well recalls strong-looking Scotch stone-cutters, who seemed to sicken mysteriously, and one after another "go West" at an early age, though their work had been chiefly in the open air.

But the most fatal effects were known to occur in the young scythe-grinders in mechanical works. These men understood from those who had gone before them that the work was highly dangerous; but the large wage made one after another step into the vacant places, like the vine-dressers who return to their homes on the dangerous slopes of Vesuvius.

MECHANICAL VENTILATION THE SOLUTION OF DUST AND SIMILAR PROBLEMS

Fortunately, modern mechanical inventions are making down-drafts and clever face-masks important means of prevention, while surfaces kept constantly wet during grinding, help to prevent flying dust particles from readily entering the lungs. But in all the varied industrial activities, it is the steady progress of applied knowledge which is going to minimize the accidents incident to the various trades and occupations. Experience soon illustrates the dangers, but, without knowledge and the intelligent appreciation of the value of a skilled artisan, the management is too often slow to introduce methods which do not seem to have any immediate commercial return. Indeed, it will not be until governments, state and municipal, are fully convinced of the money value of a trained artisan to the State as a source of wealth that we need expect to see the steady pressure, through government regulations, resulting in the introduction and inspection of mechanical means of ventilation to dilute the dust in the artificial atmospheres of close-housed industries and of a proper humidity to maintain the mucous membranes of the nose, throat and lungs in their highest condition to resist all malific influence.

Richardson & Boynton Purchases Utica Heater Plant

Announcement is made by the Richardson & Boynton Company that it has purchased the plant of the Utica Heater Company, which recently was consolidated with the National Radiator Corporation. The manufacture of Utica boilers now carried on at the Utica plant, which covers approximately 23 acres at Whitesboro, on the outskirts of Utica, will be transferred to other plants of the National Radiator Corporation as this particular part of the Utica Heater Company's business was not embraced in the sale to the Richardson & Boynton Company. The operating personnel and management will remain the same.

According to an announcement of D. Rait Richardson, president of the Richardson & Boynton Company, this firm will continue to manufacture the Perfect line of heating and cooking apparatus and will also manufacture the Utica line of furnaces, including the Superior, Super Smokeless, and Essex.

Richardson & Boynton Company recently introduced a new type of apparatus in its blue square-cased boilers and warm-air heaters. The addition of the Super Smokeless and other Utica warm-air heaters gives the company a diversified line designed to meet every requirement. A network of warehouses located at strategic centers will permit quick delivery to any point.

To many of the older men in the industry the name of Richardson & Boynton is closely identified with the progress of heating. The company was founded by Henry A. Richardson in 1837, in Worcester, Mass., and operated under his own name. In 1847, the company moved to Boston. Soon after a New York office was opened and, in 1852, the company was manufacturing not only in New England but also in Spuyten Duyvil near New York. In 1858 the firm began to manufacture at Norwalk, Conn., in addition to the other plants, and, in 1865, the name of Richardson & Boynton Company was established and the company was incorporated in 1882. In the meantime they had started manufacturing at Van Brunt Street, Brooklyn, where they were making steam and water boilers. So successful had the company's business become that, in 1898, the Brooklyn plant was abandoned for a larger factory at Dover, N. J.

D. Rait Richardson became president of the company in 1918, after holding several executive positions. Mr. Richardson's service to the industry is evidenced by his election in 1917, as president of the National Warm-Air Heating and Ventilating Association. The present executive headquarters of the company are at 260 Fifth Avenue, New York. Newly elected officers are: President, D. Rait Richardson; vice-president in charge of sales, H. T. Richardson; vice-president in charge of production, Roger Williams; vice-presidents, D. S. Richardson and A. P. Richardson; treasurer, Arthur Nichols, and secretary, Joseph Loskill.

How Would You Do It?

THIS *problem involves points not usually brought out in designing ordinary heating systems.* In the first place it is believed that the contractors were too optimistic in thinking that the air in the building could be raised from 40° F. to 70° either in half an hour or in *two* hours; experience along this line indicates that an average temperature rise of 7° to 10° F. per hour, according to the relative capacity of the heating system and the heat requirements of the building, is about the best that can be expected. But supposing that the contractors' statements are accepted at their face value, how will the two methods of heating affect the size of the boiler plant, or, in other words, how much will be the maximum boiler horsepower demand in each case?

If the total quantity of concrete in the walls, pilasters and floor slab amounts to 12,148 cu. ft., as stated, and if the building has been allowed to cool down so that the inside temperature is 40° F., then, if the outside temperature also is 40° F., the temperature of all the concrete at the beginning of the heating period likewise will be 40° F. When the building temperature has reached the desired point of 70° F., the inside face of the walls and the surface of the floor must also have risen to approximately this same temperature, as otherwise, the walls and floor still would be absorbing heat in large quantities and the room temperature would fail to reach the desired level. The outside face of the walls and the bottom of the floor slab will be assumed to be still practically at their original temperature of 40° F., so that *the average temperature rise of the concrete is approximately half of the inside and outside temperature differential.*

The specific heat of concrete is 0.25, or about ¼ that of water, and it will be necessary to reduce the quantity of concrete to pounds, multiply this by the specific heat required for 1° F. rise, and then multiply by the average rise, which is 30° ÷ 2, or 15° F., thus:

12,148 × 150 × 0.25 × 15 = 6,833,250 B.T.U. per hour.

Reducing this to boiler horsepower, we obtain

For 2-hour period:

$$\frac{6{,}833{,}250}{33{,}000 \times 2} = 103.5 \text{ B.H.P.}$$

For a ½-hour period:

$$\frac{6{,}833{,}250 \times 2}{33{,}000} = 414 \text{ B.H.P.}$$

In the 2-hour heating-up period the *rate of B.T.U. supplied* is the total B.T.U. required to warm the concrete in a period of 2 hours, divided by 2. In the ½-hour heating-up period the total B.T.U. is supplied during 30 minutes, and this is at a rate per hour of *twice the total B.T.U. supplied in 30 minutes.* Therefore, in the first case the total B.T.U. must be divided by 2, while in the second case they must be multiplied by 2 to get the *rate* of heat supplied.

Regardless of the amount of concrete, or of whatever the building is constructed, the fact remains that to warm this amount of material in half an hour it will take heat at four times the rate as it would to do the same heating in two hours. There still are other factors which must be considered which will modify these big differences, and one of them is the matter of warming the air in the building. The air must be raised from 40° to 70° and, as the contents are 290,400 cu. ft., it is not difficult to compute the amount of heat for this work; this is

$$\frac{290{,}400 \times 30}{50} = 174{,}240 \text{ B.T.U.}$$

and when this rise of temperature is accomplished in 2 hours heat must be supplied at the rate of

$$\frac{174{,}240}{2 \times 33{,}000} = 2.6 \text{ B.H.P.}$$

while the rate for a ½-hour heating-up period will be four times as great, or 2.6 × 4 = 10.4 B.H.P.

With a system of direct radiation, however, there is a certain amount of heat absorbed by the heating system itself before it begins to give off heat. Put in another way, the metal in the heating system has to be warmed up to the steam temperature, and this requires a certain heat input which is not required with the unit-heater installation or, at least, is greatly reduced. If the direct heating system contains 3800 sq. ft. of radiation (with wall radiators the quantity actually would be less), and, if the weight of cast-iron radiation is 7 lbs. per sq. ft., the weight of the radiators would be:

3800 × 7 = 26,600 lbs.

and, allowing an additional 25% for piping, the pipe and fittings will weigh

26,600 × 0.25 = 6650 lbs.,

making the total metal in the direct heating system 33,250 lbs.

The specific heat of cast iron and steel is 0.12, or about one-eighth as much as water. Therefore, the heat absorbed by the metal in the heating system, using direct radiation, will be the number of pounds multiplied by the temperature rise (which will be from 40° F. to, say, 220° F.) times the specific heat factor, 0.12, or

33,250 × 180 × 0.12 = 718,200 B.T.U.

Changing this to horsepower and dis-

Question 6

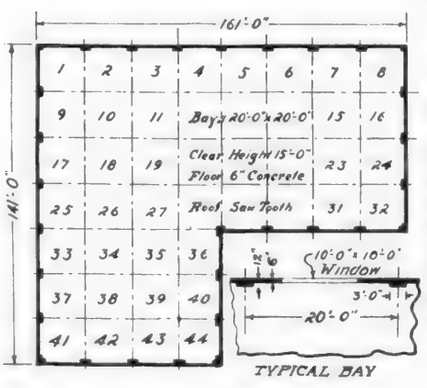
A manufacturer is about to erect a small manufacturing plant, approximately 140 ft. x 160 ft., as shown in the accompanying sketch. This building, one story high, is of concrete with a wooden roof of sawtooth construction. The floor will be of 6-in. concrete, and pilasters 3 ft. wide by 12 in. thick occur at every bay, as shown.

One contractor tells the owner that he can install radiation of the wall type and of sufficient quantity to heat the building to 70° F. in zero weather, and that, in ordinary weather—say, 40° F. outside—the building can be heated from 40 to 70° in about two hours' time.

A second contractor submits a proposition on unit heaters, claiming that under the same temperature conditions his system will heat the building up to 70° F. in half an hour, and that the owner will save 1½ hours of operation every day by using unit heaters.

This owner has to supply the boiler plant and the question is, assuming that the contractors' statements are correct, would a larger boiler plant be required in one case than in the other and, if so, how much?

Assume quantities as follows:
Concrete in walls, floor and pilasters, 12,148 *cu. ft.*
Cubic contents, 290,400 *cu. ft.*
Square Feet of Radiation, 3800
..(based on 240 B.T.U.)



Problem Presented in Question 6

tributing it over a period of two hours, there would be required:

$$\frac{718{,}200}{2 \times 33{,}000} = 10.9 \text{ B.H.P.}$$

With the unit heaters there also would be a certain amount of heat absorbed by the system, although this would be comparatively small, and it is estimated that 10% might be taken as a fair relative amount. However, this 10% is supplied in a period of 30 minutes, so that the there would be required:

$$\frac{0.10 \times 718{,}200 \times 2}{33{,}000} = 4.3 \text{ B.H.P.}$$

There still is to be considered the matter of the heat given off by the building during the heating-up period. When both the building and the outside temperatures are 40° F., there will be no heat loss from the building, but when the building has reached the temperature of 70° F. there will be a heat loss due to the temperature difference between the inside and the outside of the building, amounting, in this particular case, to 30° F. With 3800 sq. ft. of radiation, based on 240 B.T.U. per sq. ft., the rate of heat emission is

$$3800 \times 240 = 912{,}000 \text{ B.T.U.}$$

This rate of heat emission presumably is sufficient to hold the building at 70° F., when the outside temperature is zero; the number of B.T.U. required for each degree difference in temperature between the outside and inside easily is obtained by dividing this total amount by the total temperature rise or

$$\frac{912{,}000}{70} = 13{,}029 \text{ B.T.U.}$$

For a 30° difference in temperature the loss per hour would be

$$13{,}029 \times 30 = 390{,}870 \text{ B.T.U.}$$

But, as a matter of fact, the building gradually rises in temperature from 40° F. to 70° F., so that the *average* difference in temperature during the warming-up period is

$$\frac{70° - 40°}{2} = 15° \text{ F.}$$

Therefore, the heat loss per hour during the warming-up period is an *average* of

$$13{,}029 \times 15 = 195{,}435 \text{ B.T.U.}$$

When the heating-up period extends over a span of two hours this *average loss per hour* will also extend over the same two-hour period and the total heat requirement will be:

$$195{,}000 \times 2 = 390{,}870 \text{ B.T.U.}$$

But the *hourly* load on the boilers would be in proportion to the temperature rises occurring *in each hour*. During the first hour the temperature goes from 40° to 55° (giving an average temperature difference of

$$\frac{55-40}{2} = 7.5°),$$

and during the second hour the temperature goes from 55° to 70° (giving an average temperature difference of

$$55-40 + \frac{70-55}{2} = 22.5°).$$

At the close of the warming-up period the building is practically up to temperature, and the boiler load, under this condition, is at the rate of the full radiation loss or

$$\frac{390{,}870}{33{,}000} = 11.8 \text{ B.H.P.}$$

With unit heaters the same maximum radiation loss is secured as soon as the building is up to temperature, and so the maximum boiler rate would be the same as where radiators were used, as far as the heat loss from the building is concerned.

Leakage also will introduce a modifying element. If it is assumed that the leakage amounts to one air change per hour there is going to be more heat lost by leakage during two hours than there will be during a half hour. But with leakage, as with the radiation from the building, the maximum load will come when the building is up to, or nearly up to, temperature and the infiltration is being heated from 40° F. outside temperature to 70° F. inside temperature. In both cases this maximum load will not occur until the end of the heating-up period and the boiler load will be the same for either system, with the same rate of leakage and the same temperature difference.

With one air change per hour coming in through the cracks and other openings the maximum boiler load with a 30° F. temperature difference will be, as already computed, 174,240 B.T.U., or 5.3 B.H.P.

The differences in the outputs required from the boiler now may be tabulated *for an empty building, and without considering the wooden roof*, as follows:

	Direct Radiation B.H.P.	Unit Heaters B.H.P.
(a) To heat up the concrete walls and floor	104.0	414.0
(b) To warm up the air contents	2.6	10.4
(c) To warm up the heating system	10.9	4.3
(d) Radiation from building during heating-up process	11.8	11.8
(e) To heat leakage air during heating-up period	5.3	5.3
Totals	134.6	445.8

Taking into account the wood in the roof would only serve to make the difference between the boiler capacity required by the two systems even greater, as the roof lumber in the first case would have two hours to heat whereas, in the second case, the same amount of heat wuold be required to raise the lumber through the same temperature rise in one-quarter of the time, resulting in a boiler load of four times as much in the second case, as was shown in computing heat requirements for the walls.

From what has been brought out in the foregoing it must not be assumed that there is intent to discredit the unit heater. *Quite the contrary.* If the unit heater had attempted to do the heating-up of the building in the *same length of time as was allowed for the direct-radiation system it could have accomplished the same result with less boiler horsepower, as will be seen by referring to the figures.* In the first place the boiler load resulting from item (a) would be the same in both cases (104 B.H.P.), owing to the unit heater having the same length of time to do the same work; the item (b) also would be the same (2.6 B.H.P.) in both cases, for the same reason; the item (c) will remain the same as before and the last two items are identical anyway. Therefore, the only item on which a difference would be found would be in (c) and in this instance the unit heater has the best of it.

This brings out the fact that any shortening of the warming-up period in a building not only will require an abnormally-sized heating system but also will require an enormous increase in boiler capacity over that required for steady heating, even in extreme winter weather.

PROBLEM FOR NEXT MONTH

Question No. 7

A closed steel tank of 1000-gal. capacity stands in a temperature of 20° F. A steam coil of brass pipe is in the bottom to heat the water. The tank was half full of water and the water has frozen and cooled to the temperature of the air. Assuming that the weight of the coil is 100 lbs., and that the weight of the tank is 1200 lbs., how much steam must be condensed up to the time the water begins to boil if steam at 10 lbs. gauge is supplied to the heating coil? Neglect any heat loss during the heating-up process.

Benjamin Franklin's birthday, January 17, was celebrated in New York and many other cities. At his statue in Park Row, New York, wreaths were placed by the A.S.H. & V.E., represented by Past President Champlain L. Riley and Secretary A. V. Hutchinson. It has been announced by the American Society of Heating and Ventilating Engineers and the Benjamin Franklin Memorial Committee of the Sons of the American Revolution, that Benjamin Franklin has officially been designated as "patron saint" of the American Society of Heating and Ventilating Engineers.

New Government Tests on Glasses Transmitting Ultra-Violet Rays

UNDER date of January 14, 1928, the Bureau of Standards has published new data on the transmissive properties of new glasses and organic substitutes for window glass. As noted in the report, the visible rays of light are comprised between the approximate wave lengths of 760 mμ in the red and 400 mμ in the violet. Wave lengths longer than 760 mμ are called infra-red, and those shorter than 400 mμ ultra-violet. Though the average eye is not sensitive to wave lengths shorter than 400 mμ such rays actually exist in the light of the sun, extending down to a wave length a little more or a little less than 300 mμ, depending on the time of day, season of year, latitude, altitude, and clearness of atmosphere.

Since ordinary window glass shuts out the ultra-violet rays below about 310 mμ, much attention has been given of late to the production of special glasses, transparent to the shortest wave lengths which the atmosphere permits the sun to furnish us. This letter circular gives the results of ultra-violet transmission tests which have been made at the Bureau of Standards upon a number of such special glasses and common window glass.

TOTAL TRANSMISSION OF VARIOUS GLASSES FOR THOSE ULTRA-VIOLET SOLAR RAYS TO WHICH COMMON WINDOW GLASS IS OPAQUE

Using a filter method, direct measurements, with sunlight as source, have been made during the noon hours of especially clear days from April to December, 1927.

These measurements covered the solar spectral region to which common window glass is opaque (below about 310 mμ). Table 1 gives for that region the total transmission found for the following specimens:

TABLE 1. TOTAL TRANSMISSIONS OF VARIOUS GLASSES, WHEN NEW, FOR THE ULTRA-VIOLET SOLAR RAYS TO WHICH COMMON WINDOW GLASS IS OPAQUE

Trade Name	Per Cent Transmission
Fused quartz	92
Corex	92
Helioglass (Vioray[1])	50
Vita glass	50
Cel-o-glass[2]	20
Quartz-lite	5
Flexoglass[3]	1
Common window glass	0 to 5

(1) Vioray is the foreign trade name for Helioglass.
(2) This consists of a fine wire screen whose interstices are covered with cellulose acetate.
(3) This is a loosely-woven fabric usually covered with paraffin.

SPECTRAL TRANSMISSIONS OF VARIOUS GLASSES FOR THE ULTRA-VIOLET RAYS

What is described as a second and more reliable method of measuring the relative transparency of a specimen of glass to ultra-violet light is to determine its spectral transmission curve, wave length by wave length. The bureau made such tests by means of an artificial source of light (quartz mercury arc) giving a line spectrum richer in ultra-violet than the solar spectrum.

Table 2 gives the transmission values at 302 mμ—the wave length of an intense mercury line which is described as of convenient value for making such tests.

TABLE 2. PER CENT TRANSMISSION OF VARIOUS GLASSES AT 302 mμ, WHEN NEW

Trade Name	No. of Samples Tested	Average Thickness, Mm.	Average Per Cent Transmission at 302 mμ
Fused quartz	1	4.7	92
Corex	4	2.8	89
Helioglass	15	2.3	56
Vitaglass	15	2.5	44
Cel-o-glass	5	.1 (about)	30
Quartz-lite	16	1.9	0.5
Common window glass	14	3.3	0.0

One of the interesting characteristics of glass substitutes, noted by the bureau, is the decrease in transmission at 302 mμ and neighboring wave lengths (295 to 310 mμ by exposure to ultra-violet radiation from the sun, quartz mercury arc, and carbon arc. The rate of change is much more rapid with the arc than with the sun and varies also with the different glasses.

Vitaglass has been on the market the longest, hence concerning this glass we are able to give the most information on solarization. A sample which had been in a hospital window in Rhode Island for a year was found to have a transmission of 25% at 302 mμ (for thickness = 2.3 mm). Further exposure to the quartz mercury arc reduced the transmission but little, showing that solarization was complete.

Exposure in Washington of a sample (t = 2.35 mm) of Vitaglass directly to the sun for 123 hours (between 9 A.M. and 3 P.M. during June, July, and August) decreased the transmission from 47% to 35%. Our tests show that the greatest decrease in transmission occurs during the first few weeks' exposure. The average transmission of Vitaglass at 302 mμ after complete degeneration by the mercury arc is about 25% for a thickness of 2.3 mm.

Helioglass has not been on the market for a sufficient length of time to obtain a complete solarization test. Two samples each of Helioglass and Vitaglass, exposed simultaneously to the sun in October to December, were found to have decreased in transmission at about the same rate. The average transmission of Helioglass at 302 mμ, after complete degeneration by the mercury arc is about 30% for a thickness of 2.3 mm.

Corex glass appears to undergo no appreciable change in transmission when exposed to solar radiation. For example, a sample of cathedral finish Corex which had been in a greenhouse roof in New York for 14 months was found to have, as nearly as could be measured on that kind of surface, the same transmission as a new sample. It was then polished plane and found to have a transmission of 89.5% at 302 mμ, while the average transmission for new samples as given in Table 2, is 89%.

On the other hand, exposure to a quartz mercury arc causes a very marked decrease in the transmission.

Cel-o-glass (cellulose acetate) becomes opaque at 302 mμ, and shorter wave lengths, after 25 hours' exposure to the quartz mercury arc. A sample that was exposed to the sun for 400 hours during the months of April to October, decreased but little in transparency at 302 mμ. On the other hand, samples that transmitted 30% at 302 mμ, when new, transmitted only 5% to 10% at this wave length after being exposed on the side of a building continuously day and night for eight months, April to December, showing that the change in transparency may be owing to the varying conditions of the weather.

Quartz-lite is not appreciably affected by sunlight. Exposure to the quartz mercury arc decreases its transmission slightly (measured at 313 mμ).

Common window glass is also decreased slightly in transmission by exposure to the quartz mercury arc but changes inappreciably in sunlight.

Sturtevant Fans in Atlantic City Auditorum

In the equipment of Atlantic City's new convention hall which was described in last month's issue, the 31 motor-driven fans comprised in the ventilating equipment, having a normal capacity of 1600 tons of air per hour, were of B. F. Sturtevant Company's make, as were the 75 vent fans, with a capacity for discharging 2900 tons of air per hour. As was stated in the article, the fans are located in nine fan rooms situated between the main roof trusses, 56 ft. above the main floor.

Correspondence

Degree-Days and the Demand Factor in Heating

EDITOR HEATING AND VENTILATING MAGAZINE:

In the January issue of THE HEATING AND VENTILATING MAGAZINE you make editorial comment on the term "degree-days" and elsewhere in the issue you show its application and, of course, the points are well taken.

While the term "degree-days" is a very ingenious one, it really is not in the same class with other engineering terms, for example, the B.T.U. that you mention. However, it undoubtedly serves a useful and convenient purpose.

In the Transactions of the A.S.H. & V.E. Vol. 25, 1919, there is a paper on the engineering economics of heating which gives the fundamental development of weather control over heating for determining or estimating fuel consumption. This paper indicates that up to that time investigations along these lines could not be made to agree because certain factors were missing. Accordingly this paper lays down the rule which shows that the true relation is "coal required for 1 sq. ft. radiation operating one hour at 1% demand."

While this specifically deals with coal, the class of fuel would not change the law.

You will note that the unit of capacity, namely, 1 sq. ft. is given, the period of time, one hour, is included, and the usage or demand is given in per cent.

This demand factor is explained on page 191 of the Transactions referred to and shows that it is the difference between the inside and outside temperature divided by the maximum temperature differences used in the design or computation of the heating plant.

You will note that the "degree-day" is only a partial description of the demand factor above outlined.

The reason for calling this to your attention is the feeling that an engineering basis should be used and further that original engineering work of this kind deserves at least mention when a purely popular development is the result of it.

New York. M. WILLIAM EHRLICH.

". . . . Of That Balminess Redolent of Spring"

EDITOR HEATING AND VENTILATING MAGAZINE:

"We dream of the day when some bright mind will devise a comfortable convention chair, when the air will be of that balminess redolent of Spring . . ." —THE HEATING AND VENTILATING MAGAZINE, P. 65, Vol. XXV, No. 1.

Will Rogers? Al Jolson? Willie Collier? on the Radio? No, just our old friend Armagnac of THE HEATING AND VENTILATING MAGAZINE endeavoring to be poetic.

This is a job for further "Research" or it might reasonably be referred to the Building Department.

The Convention Chair being settled, we are now called upon to tackle that "balminess redolent."

The lack of "Balminess Redolent" in Convention Halls appears in different guises — overheating, under heating, draughts, odors, sleepiness or headaches —and causes the delegate to become poetic.

Remove the products of combustion, the moisture produced by the human body, maintain a definite relation between temperature, relative humidity and the air movement then the air will be balmy and "redolent of Spring."

There you are, that is the basic complex to the whole question of Balminess. It's the wedding month reproduced in schools and churches, theaters and convention hall, twelve months of the year. Roses are in bloom, Jasmine, Hyacinth, Narcissus and Tube roses. The atmosphere is impregnated with their bouquet, the Thrush and the Nightingale, the Wren and the Pewee, each having mated.

Some wise guy said: "Ventilation consists of maintaining a space occupied in such a state that the occupants are oblivious to the atmosphere condition."

Such a manifestation of contemplated satisfaction is not a germ born in the mind of the fellow who invented the "Unit Ventilator" or dreamed of "open windows" for school houses in Sheol.

Commercialism,—That's the impasse, a stranger to odors unacquainted with lassitude—*temperatura insolatus.*

New York. D. S.

N. D. H. A. Announces District Heating School

A short study course is announced by the National District Heating Association to be held under its auspices at Purdue University, Lafayette, Ind., May 21-26, inclusive. The work is intended primarily for employees of district heating companies but will be broad in character and of value to anyone engaged in heating work. Attendance will not be limited to members of the association but will be open to anyone who is interested.

There will be two divisions, an elementary course and an advanced course. In the elementary course such subjects as the fundamentals of heat and the properties of steam; heat losses from buildings; and various types of heating and ventilating systems will be studied. In the advanced course the subjects will include distribution system design and construction; the operation of heating systems in buildings; meters; rates; etc.

A similar course was held last year and was well attended. It is expected that a much greater number will be present for the 1928 school.

The headquarters of the action of the National District Heating Association are at Greenville, O., D. L. Gaskill, secretary.

A. C. Rogers at Head of Toledo's Water Department

The many friends of A. Carle Rogers, well known throughout the district heating industry, and for many years superintendent of heating for the Toledo

A. Carle Rogers

Railways and Light Company, will be interested to learn of his appointment as water commissioner of Toledo. Mr. Rogers retired from the heating business in 1920 to engage in other work.

To Mr. Rogers, perhaps more than any other man, is due the credit for the organization of the National District Heating Association of which he was the first president. He is a member of the A.S.M.E. and of the A.S.H. & V.E.

American Oil Burner Association Incorporates

After functioning for nearly five years as an unincorporated body, the American Oil Burner Association has been incorporated under the laws of the State of New York as a membership corporation.

In a bulletin containing this announcement, the activities of the association are presented at length. Under the head of "the smoke abatement

problem," the bulletin states that while the association is thoroughly in accord with the idea of abating the smoke nuisance, it is protesting vigorously against the adoption of the method of enforcement proposed by the advisory committee to Commissioner Harris of the New York City Department of Health. The principal point at issue is the proposal to classify fuel oil burners generally with persistent smoke producers.

On the subject of inside tank storage, it is reported that at the October meeting of the Board of Directors in Philadelphia, it was decided that permission to increase the inside storage from 275 gal. to 550 gal. and not to permit more than 275 gal. to be set by gravity in the present rules would be a very desirable step and one which would open up a much larger field of prospects. The bulletin states very frankly that this policy has met with objections by some of the members, principally pump manufacturers.

A report is included relating to the organization of the Anthracite Co-operative Convention at Mt. Carmel, Pa., where 8000 representative men in the anthracite industry were present. The meeting was also attended by Secretary of Commerce Herbert Hoover. Many of the speakers made a plea for a better spirit of co-operation in the industry and it was stated that the industry is now spending $500,000 a year for sales promotion work. A display of advertising of competing fuels was presented, made up largely of fuel oil and oil-burner advertising. The display stretched across the stage of the meeting room and made a deep impression.

The advice given to the meeting was that if they decided to go into co-operative advertising at all, to plan for a continuous effort extended over three and preferably five years and to pledge their subscriptions on that basis.

New manufacturer members of the association are Domestic Engineering Company, Coleman Lamp & Stove Company, Ltd., Rickard Engineering Corporation, Franklin Oil Heating, Inc., Cleveland Steel Products Corporation.

Favors Increase in Minimum Size of Oil Tanks

H. P. Snyder, vice-president of the First National Bank, Chicago, was the guest speaker of the January meeting of the Chicago Oil Burner Association, held at the Allerton Club, January 10. His subject was "Banking Relationships and Business in 1928."

Mr. Kyle, of the Ordinance of Standardization Committee, outlined the efforts of his committee to obtain a revision of the Chicago ordinances providing for lower permit fees and also to increase the limitation in the size of gravity tanks from 50 gal. to 275 gal. Several objections had been raised to this procedure and a lengthy discussion followed on the subject of tank sizes. At its conclusion, the association instructed Mr. Kyle to proceed with the original program of his committee.

In the discussion of tanks, Mr. Puhl offered the proposal that all oil-burner installations should be inspected by an inspector employed by the association and then certified by the association when so passed. Mr. Puhl was asked to present his plan in detail at the next regular meeting. Another proposal was for a full-time paid secretary. This also was put over to another meeting with the suggestion that the plan incorporate a method for receiving the necessary funds.

Sixty-three members and guests were in attendance. In the absence of President Straight, Vice-President Barnes was in the chair. Fred Atterbury, Automatic Tank Installation Works, was elected to association membership.

Dunham Company Announces Centrifugal Vacuum Pump Merger

In an announcement issued by the C. A. Dunham Co., Chicago, it is stated that the business formerly known as the Young Pump Company has become an integral part of the C. A. Dunham Company, and that the Young centrifugal vacuum pump is now a consolidated unit with the Dunham vacuum pump.

The Dunham vacuum pump, as the combined unit will be known, has been under laboratory development for several years. It embodies the principle and general form of the Young pump. Added to this and to laboratory research is a large displacement capacity, a marked increase in water capacity, and the ability to produce an unusually high vacuum simultaneously with the discharge of condensation to the boiler, making the pump particularly adaptable to the Dunham differential vacuum heating system.

The company's manufacturing plant at Michigan City, Ind., where Dunham pumps now are being made, will be greatly increased in capacity during 1928. This will give the Dunham Company three plants, in Marshalltown, Iowa, Michigan City, Ind., and Toronto, Canada, respectively. The year 1928 marks the 25th anniversary of the C. A. Dunham Company.

Wolverine Tube Company to Erect New Plant

Aided materially by the tremendously increasing sales of automobiles, gas boilers, oil burners, instant boiler heaters, air-conditioning apparatus, copper tube radiators, and similar equipment, the Wolverine Tube Company, of Detroit, has expanded to such an extent that it has become necessary to erect a new plant. This will be 115 ft. wide and 600 ft. long and will cost approximately a quarter of a million dollars. It will supplement the present plant which occupies an entire city block with almost five acres under roof. This company produces tubing manufactured by new processes from ⅛ in. diameter up to the largest sizes in use, in lengths up to 100 ft.

Deaths

A. E. Ayers, a partner of the Rautman Plumbing and Heating Co., Seattle, Wash., died November 19, 1927. Mr. Ayers was born May 29, 1863, in Lawrence County, New York, and spent more than 40 years actively engaged in heating and ventilating work. He was in charge of work for the Clark Steam Heating Company prior to being in business for himself for almost 30 years. Mr. Ayers was well known in the northwest and was a member of the A.S.H. & V.E. for the past seven years.

Senter M. Jones, first vice-president, manager of purchases, and member of the executive committee of the Century Electric Co., St. Louis, Mo., died December 11, 1927, at the age of 47. In 1906 he entered the organization and always had a keen interest in employee activities. Mr. Jones was a member of the American Institute of Electrical Engineers, St. Louis Electrical Board of Trade, and the St. Louis Chamber of Commerce.

Charles A. Ford, of Whitney and Ford, heating and plumbing wholesalers of Chicago, died December 28. Mr. Ford was a partner in this business for 25 years, and is well known in the heating industry, and especially in the Chicago territory.

Prof. Emile Jerome Fermier, head of the department of mechanical engineering and vice-dean of the school of engineering, A. & M. College of Texas, died December 19, 1927, at the age of 59. He received the degree of B.S. from Valparaiso University, in Indiana, in 1887, and the degree of bachelor of mechanical engineering from Purdue University in 1894, as well as the M.E. degree from that university in 1895.

Daniel Kennedy, president of the Kennedy Valve Mfg. Co., Elmira, N. Y., died at Hot Springs, Ark., January 14, at the age of 80. Mr. Kennedy organized the company 50 years ago and has since guided its destinies. He had his first business venture in 1877, being awarded the contract for building the gate valves for the old Boston Dry Dock which is now owned by Robbins Dry Dock and Repair Company. This contract established the firm of Daniel Kennedy with a small shop in New York City. In 1890 larger quarters were needed and the plant was moved to Coxsackie, N. Y. The firm was incorporated at that time and the name changed to the Kennedy Valve Mfg. Company.

Selling Gas Service to the Architects

IN an effort to keep architects, owners and builders informed on gas utilization, a series of bulletins on eleven major subjects has been prepared by the Architects' and Builders' Service Committee of the American Institute of Architects. These bulletins are distributed by the Producers' Council, made up of representative manufacturers and associations in the building field affiliated with the A.I.A. More than 4000 architects and architectural concerns now have these bulletins, states Robert B. Mahn, manager, Architects' and Builders' Service Division, of the Consolidated Gas Company of New York.

With these bulletins in the local architect's office a point of contact is established for the service departments of the gas companies with those of the architects and builders and with those divisions or bureaus coming into contact with the local building field. Included in the subjects covered are:

House heating by gas; data on gas-fired steam radiators; electric air heating units; data for estimating hot water requirements and size of gas equipment for storage systems; estimating service water heater sizes for loft and office buildings; gas piping and flues; gas ranges or cooking stoves; gas refrigerators (two bulletins); data on gas-heated domestic clothes dryers; domestic gas-fired incineration, and gas safety code (made permanent American standard).

Among the companies and associations represented in the Producers' Council are The American Brass Company, A. M. Byers Company, Celotex Company, Chamberlin Metal Weather-Strip Company, Copper and Brass Research Association, Eastern Clay Products Association, General Electric Company, Jenkins Brothers, Johns-Manville, Incorporated, Monarch Metal Products Company, National Tube Company, Spencer Turbine Company and the Westinghouse Electric & Manufacturing Company.

HOUSE HEATING BY GAS

In the bulletin devoted to "House Heating by Gas" is reproduced the Iso-Gas-Consumption chart published by THE HEATING AND VENTILATING MAGAZINE, for October, 1925, showing the points of equal heating load throughout the United States.

Following sections on the cost of gas heat and the construction and location of the building, the bulletin takes up, in order, gas required, the selection of boiler size, thermostats, safety pilots, conversions, flues and back draft diverters for large gas-burning appliances.

Under "Gas Required" the bulletin states:

The uniformity of gas as a fuel makes it possible to predict with accuracy the amount that will be required to heat a building of any given size. However, it is recognized that climatic differences in various sections of the country make it necessary to provide some means for adjusting the fuel consumption. A new unit, the degree-day, was devised. This is the product of the number of days in the heating season by the difference between the average temperature for the heating season and 65° F. For example, if the average temperature for January is 30° there would be 35 x 31 or 1085 degree-days in the month.

Because of the high efficiency and the constancy with which gas appliances operate it is possible to develop unit figures giving the amount of gas required per degree-day for any given kind of a heating system. With a gas of 550 B.T.U. per cubic foot (a common standard in this country) the following unit figures are obtained:

For each square foot of net installed steam radiation 0.21 cu. ft. of gas per degree-day.

For each square foot of net installed water radiation 0.12 cu. ft. of gas per degree-day.

For a warm-air system 0.55 cu. ft. of gas for each 100 cu. ft. of building contents (approximate only) or 0.75 cu. ft. per 1000 B.T.U. hourly loss. These units assume that the minimum outside temperature for which the heating system is designed will be 0° and that a temperature of 70° F. is to be maintained indoors. For other outside minimum temperatures multiply the units by the following factors:

For plus 20° x 7/5
For plus 10° x 7/6
For minus 10° x 7/8

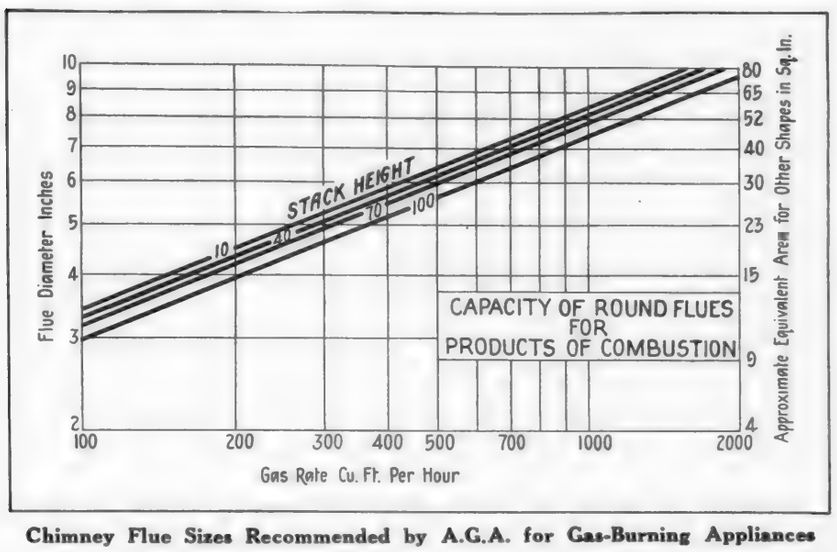
The determination of the amount of gas which will be used becomes a simple matter of multiplying together the degree-days, the unit consumption and the size of the heating system. Example: How much gas would be required to heat a house having 400 sq. ft. of steam radiation located in central Illinois, assume 5500 degree-days x 0.21 x 400 = 462,000 cu. ft.?

Under "The Selection of Boiler Size," the following table is presented giving the percentage of radiation to be added to that installed, so as to take care of the combined starting and piping allowance.

STARTING AND PIPING ALLOWANCE

Sq. Ft. Installed Radiation Steam	Water	Percentage to Be Added
250	400	60
500	800	52
750	1200	48
1000	1600	44
1500	2400	40

Flue sizes are given in chart form. In general they are smaller than those needed for corresponding coal-burning equipment. The chart gives the flue pipe diameter for round pipes, and the approximate equivalent area for other shapes required for the various gas consumptions given. To determine the size of flue when the gas consumption is known, follow the vertical line representing the cubic feet of gas burned per hour upward until it intersects the curve of the nearest stack height. Extend a horizontal line across to find the round flue pipe diameter or the equivalent area as desired.



Chimney Flue Sizes Recommended by A.G.A. for Gas-Burning Appliances

---

VENTILATION OF VEHICULAR TUNNELS is the title of a new publication, issued by the Department of Commerce, which consists of a report of the U. S. Bureau of Mines to the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission. This booklet which has been reprinted from the *Journal* of the A.S.H. & V.E., was written by A. C. Fieldner, Yandell Henderson, J. W. Paul, R. R. Sayers, and others.

Huge Building Volume to Continue During 1928

BASED on its remarkably accurate predictions of previous years, great reliance will be placed in the prediction which has just been made by *The Architectural Forum*, concerning building construction in 1928. Although the estimate issued by this publication in 1927, ran into figures over $7,000,000,000, it proved to be more than safely conservative.

"In making a forecast of building activity for 1928," states C. Stanley Taylor, of *The Architectural Forum*, "we face an unusual and paradoxical condition. On one hand we hear many casually or even thoughtfully-expressed opinions indicating that there will be less building activity in 1928 than in several past years. On the other hand, the *Forum's* survey, on which this forecast is based, has been carried out in exactly the same manner used for the last seven years. Here we have actual evidence of work on architects' boards or seriously contemplated for the year 1928—a volume of work which is testified to by 1793 individual confidential reports from architects.

"These figures indicate that building will continue in 1928 at least in the same volume if not reaching even greater totals than 1927.

"The national percentages indicated for 1928 show greater activity in the construction of automotive buildings, residential buildings of all kinds, public buildings and welfare buildings. There is evidently to be a decrease in the amount of bank building, club and fraternal buildings, community buildings, churches and office buildings. Hotels and apartment hotels are evidently to develop approximately the same volume. School building will be approximately the same, while the demand for theaters shows a slight falling off.

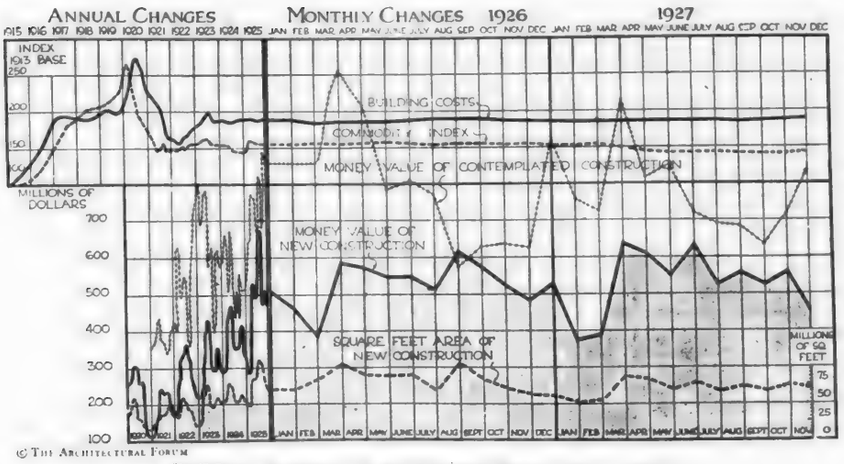
"Examining comparative conditions of demand for new buildings in the different geographical sections of the country as presented in these tabulations, we find the more striking changes to include a developed demand for automotive buildings in the northeastern States with a considerable increase in the north Atlantic and southwestern States. We find the requirements for bank build-

Detailed Forecast of New Building Construction for 1928

BUILDING TYPES	N. EASTERN STATES	N. ATLANTIC STATES*	S. EASTERN STATES	S. WESTERN STATES	MIDDLE STATES	WESTERN STATES	U.S.A.
Automotive	$16,702,000	$68,716,000	$8,214,000	$17,554,000	$67,605,000	$18,640,000	$197,431,000
Banks	10,674,000	72,693,000	2,278,000	10,202.000	34,300,000	7,247,000	137,394,000
Apartments	10,437,000	347,500,000	13,862,000	22,400,000	186,400,000	72,230,000	652,829,000
Apartment Hotels	572,000	56,787,000	4,970,000	12,935,000	105,987,000	36,267,000	217,518,000
Club, Fraternal, etc	10,557,000	46,287,000	2,937,000	15,000,000	86,742,000	14,440,000	175,963,000
Community and Memor s	3,146 000	13,400.000	580,000	5,265 000	41,760 000	10,645,000	74,796,000
Churches	19,860,000	48,740,000	12,635,000	20,900,000	71,367,000	37,640,000	211,142,000
*Dwellings (Below $20,000)	19,780,000	76,730,000	8,700,000	16,360,000	49,400,000	26,372,000	197,342,000
Dwellings ($20,000 to $50,000)	11,420,000	69,210,000	7,935,000	12,150,000	37,610,000	24,640,000	162,965,000
Dwellings (Over $50,000)	8,700,000	44,935,000	6,720,000	11,345,000	31,210,000	16,660,000	119,570,000
Hotels	21,487,000	107,272,000	19,950,000	45.175,000	105,200,000	42,917,000	342,001,000
Hospitals	22,724,000	104,210,000	8 715.000	21,320,000	110,114,000	39,200,000	306,283,000
†Industrial	18,215,000	79,362 000	7,100.000	12,222,000	121,000,000	22,917,000	260,816,000
Office Buildings	26,376,000	139,674,000	9,854,000	57,473,000	263,413,000	87,720,000	584,510,000
Public Buildings	24,207,000	122,761.000	4,893,000	17,869,000	132,171,000	28,900,000	330,801,000
Schools	42,371,000	197,613,000	36,827,000	46,282,000	163,413,000	82,666,000	569,172,000
Stores	11,780,000	54,776,000	5,103,000	8,086,000	39,763,000	26,713,000	146,221,000
Theaters (All Types)	21,920,000	43,114,000	4,167,000	3,777,000	71,620,000	17,340,000	161,938,000
Welfare Y.M.C.A., etc.	10,140,000	41,614,000	4,700,000	5,731,000	38,246,000	6,143,000	106,574,000
TOTAL VALUE OF NEW BUILDINGS	$311,068,000	$1,735,394,000	$170,140,000	$362,046,000	$1,757,321,000	$619,297,000	$4,955,266,000

New Construction Under Architect's Specifications — As shown in above tabulation	$4,955,266,000
*Small Dwellings Not Designed by Architects — Estimated about 80% of total	789,368,000
†Industrial Buildings Not Designed by Architects — Estimated 50% of total	260,816,000
Other Buildings Not Designed by Architects — Estimated at 10% of total after deducting above two classifications	499,678,000
TOTAL ESTIMATED EXPENDITURE FOR NEW BUILDINGS IN 1928	$6,505,128,000 (Not Including Public Works and Utilities)

© THE ARCHITECTURAL FORUM



Building Activity in the United States Since 1915

ings falling off everywhere except in the southwestern States. The figures for apartment buildings indicate a sharp drop in requirements in the northeastern States to almost half the total of last year. On the other hand, in the north Atlantic and in the western States there is a slight increase in requirements. Apartment hotels show a sharp falling off in the north Atlantic States but double the requirements of last year in the middle States. While the demand for apartment buildings has fallen off sharply in the northeastern States, the requirements for individual dwellings of all types have increased materially, particularly for dwellings under $20,000.

"In the hotel field the northeastern and north Atlantic States indicate an increased demand in spite of the great activity which has taken place in this section of the country. There is an increased demand in the northwestern States for new hotels but a sharp falling off in the western States. The total indicates exactly the same percentages for 1928 as shown in 1927, which is somewhat unexpected, as the hotel industry has not been looking forward to as much building activity in 1928 as in 1927. Of course, it may be that economic conditions in the hotel field will prevent the carrying out of a number of projected operations, but on the other hand, there will unquestionably be the greatest volume of remodeling ever known to this particular industry.

"Other interesting comparisons will be found in studying the figures shown for the various types of buildings. For instance, the southeastern States indicate a greatly increased demand for school buildings, while in the northeastern and middle States, there has evidently been a falling off of requirements for educational structures.

"It is predicted that building activity during the year 1928 will carry along in a much stronger manner than has generally been anticipated and that any decrease in volume which might be the result of lessened activities on the part of speculative builders will, in turn, be offset by a number of large investment and institutional projects which have been held in abeyance during 1926 and 1927."

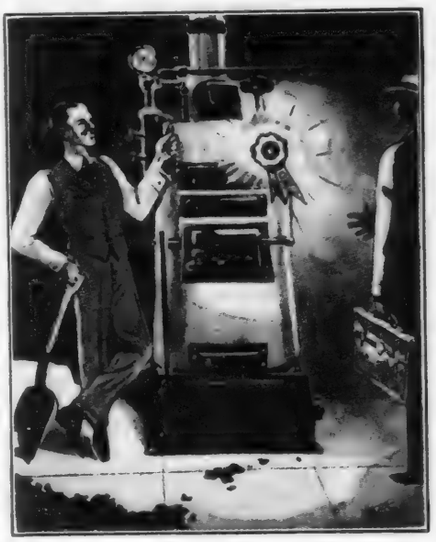
General Magazines Take Up "Certified Heating"

How "certified heating" is being brought to the attention of the public is illustrated in a recent article in *Charm*, which appears under the title of "A Guaranteed Heating Plant." The author is Winifred Moses.

After discussing the importance of an adequate heating plant, the article continues: "At the present time there is an association of bona fide heating contractors nationally organized, and this association will guarantee any heating plant installed by any member of its association if put up in accordance with its adopted standards, to wit, a boiler that will heat the house to 70° in coldest weather with radiators so located that there will be no cold rooms, that piping or fittings shall not be of inferior quality, and that the layout of pipes shall be installed according to good engineering practice. And this means that in case of defect or deficiency in the plant, such defect or deficiency is made good and that without cost to the purchaser.

"The contractors who are members of such an organized body or association have at their command a vast amount of standardized knowledge gained not only by experimental work in the laboratory but by years of practical experience, the results of which, in the form of data, will enable them to determine the amount of radiation from all sorts of buildings, the amount of heat required to keep these buildings warm, the heating capacity of the different types of boilers, the carrying capacity of different sizes of pipe, and the best method of arranging these pipes with their connecting valves and drains. All this is at the disposal of the average builder, if he wishes to avail himself thereof.

"The first step in the procedure for securing a heating plant that will prove satisfactory, and a joy forever after, is to see that your heating contractor is a member of this association. This duly qualified member of this association (1) views your house, takes all of the foregoing conditions into consideration and selects (a) a boiler of standard make of sufficient capacity to heat your house under these conditions in the coldest weather without undue consumption of fuel; (b) the right size of pipe, and plans its arrangement, connections and drains, so that the heat will be carried to the radiators in the most efficient manner, and (c) decides on the proper number and location of the radiators. (2) These plans and specifications then are presented to an association engineer, and if they are satisfactory and are approved they are incorporated in the building specifications. (3) When the installation of boiler and pipes has reached the roughed-in-stage, they receive a second inspection and checking from the association engineer to see that the work has been done according to specification. If this is satisfactory, the work is finished. (4) When the work is completed and ready for operation it gets a final inspection and, if everything is found satisfactory, the boiler is honored with an identification plate which guarantees that it is made according to standard, that it will give the service which is required of it, and, in addition to this, the owner of said boiler receives a certificate signed by the association certifying to the character of the job."



A Layman's Conception of "Certified Heat"

New Weekly Service for Engineering Index

American Society of Mechanical Engineers has initiated a comprehensive scheme for indexing the 1500 technical publications of the world appearing in 17 languages in 37 countries now received in the Engineering Societies Library, New York. The index items will be printed on cards and mailed weekly to the subscribers of this new service.

The project was authorized by the A.S.M.E. Council as an important extension of the Engineering Index in its service to research and the development of industry, and to bring to every one in the world the storehouse of information appearing in the technical literature of to-day.

American Society of Heating and Ventilating Engineers

Illinois Chapter Discusses Unit Heaters

One hundred and twenty-seven members and guests of the Illinois Chapter gathered at the Sherman Hotel, Chicago, January 10, and, at the meeting that followed, listened to a talk by W. D. Graham, of the York Heating and Ventilating Corporation, on the application of unit heaters to industrial plants.

The members attested their bereavement in the death of James Doherty, vice-president of the chapter, by standing in silent meditation, following the reading of resolutions prepared for transmission to his family and for incorporation in the records of the chapter. Out of respect for Mr. Doherty it was voted to hold the office of vice-president open until the next annual meeting.

Two new members were admitted to the chapter: H. F. Meyer, New York Blower Company, and E. M. Tenant, C. A. Dunham Company.

President Heckel, presiding, then introduced Mr. Graham, who said that a comprehensive title for his talk would be: "Industrial Plant Heating by Means of Heat Diffusers." He pointed out the difficulty of heating large industrial enclosures, many with roofs from 25 ft. to 75 ft. above the floor, and said that the problem really resolved itself into that of uniformly spreading heat over the lower working zone and accepting a high temperature under the roof trusses as a necessary evil.

Mr. Graham enunciated the principles underlying the design and functioning of the York unit heater, showing, with the lantern, diagrams to illustrate the various points made. Interspersed with the drawings were photographs of smoke-bomb tests designed to demonstrate the correctness of the sketches. He gave details of numerous installations of floor-mounted unit heaters. In some cases this scheme of heating had supplanted radiation that had not given satisfaction. In each case temperature readings had been taken, and the differential, per foot of height, was stated. The results, he said, while differing widely, as might be expected with such a range in structural characteristics, all showed less temperature increase per foot of altitude than the usual allowance.

There followed a lengthy and lively discussion, mainly participated in by representatives of unit heater manufacturers of various types. The statement was made that Mr. Graham had failed to "give the devil his due" when, in illustrating the functioning of unit heaters other than the one in which he was interested, he had smoke-bomb photographs made when outlet velocities of 400 ft. per min. were obtained. A. J. Johnson said that, as far as he knew, these unit heaters were designed for velocities not under 750 ft. per min., and that a comparison on a lower velocity was not fair.

A keen discussion was led by E. P. Heckel, W. J. Mauer, T. J. Monoghan, A. G. Sutcliffe, M. K. Arenberg, Henry Mathis, A. J. Johnson, G. H. Blanding, L. D. Emmert and H. H. Valiquet.

Illinois Chapter Told of Work of New York Commission on Ventilation

Samuel R. Lewis, chairman of the A.S.H. & V.E. Committee on Research and D. D. Kimball, a member of the New York Commission on Ventilation and a past-president of the A.S.H. & V.E., were the principal speakers at the December meeting of the Illinois Chapter, held at the Hotel Sherman, Chicago, December, 12.

After reviewing the research work being undertaken at various universities, Mr. Lewis took up the subject of school house ventilation. He referred to the proposed Rochester, N. Y., ventilation tests, which were to have been conducted in co-operation with the American Public Health Association. These experiments, he stated, have been abandoned on account of the cost of putting the school buildings in proper condition, and also on account of the fact that both sides could not agree as to just what kind of data was to be collected.

Mr. Lewis read portions of the report of the New York Commission on Ventilation and made the comment that, after all, both sides were in agreement on many things and that they should get together and find that mysterious influence in the air which so contributes to the health, and the lack of which may be responsible for the prevalence and increase in respiratory diseases. He said there are many points to be taken into consideration regarding the type of ventilation system, and that the size and construction of the school buildings should determine the type used. He also demonstrated by means of a chart the saving that could be effected in the cost of the heating plant and the maintenance and fuel charges by proper insulation of a building and weather-stripping of the window and door openings.

Mr. Lewis was followed by Mr. Kimball, who remarked upon the fact that this was the first meeting of a chapter where such a friendly feeling had been displayed toward the work of the New York Commission on Ventilation and he felt that the two groups were not so far apart after all. Mr. Kimball said he recognized that there are certain traditions in school house construction where mechanical ventilation must and should be installed. He added that the friendly feeling initiated between the two organizations should have a far-reaching effect in co-ordinating the efforts of both groups toward the establishment of a better understanding of the requirements of proper ventilation.

New York Chapter Discusses Building Insulation

Clark Keeler, of the Beaver Products Company, was the principal speaker at the January meeting of the New York Chapter, held January 16 at the Building Trades Club, New York. The subject was "Insulation," with reference to that used for insulating walls and roofs. Mr. Keeler classified building insulating materials into four groups: First, the quilt type; second, the board type, third, the filler type and, fourth, the powder type. He referred to a movement which is under way to assign a single coefficient of heat transmission to each type. For the quilt type it is proposed to make the coefficient 0.30; for the board type, 0.35; for the filler type, 0.40.

Most of his talk was devoted to the filler type which is composed of cellular gypsum, shipped to the job in powder form and there mixed with the water and poured. He said that the three factors to consider were time, thickness and area. He stressed the importance of thickness and gave a figure of 3⅝ in. as a convenient thickness to adopt.

Mr. Keeler cited a number of cases where the use of cellular gypsum had effected economies. "Such efficiency," he added, "is so well authenticated that at least one organization of heating contractors is preparing a bulletin guaranteeing a reduction of from one-quarter to one-third in the size of a heating plant when suitable insulation is used."

Before introducing the speaker of the evening President Richard A. Wolff announced that hereafter the chapter will meet in the new quarters of the Building Trades Club, in the Park Avenue Building, One Park Avenue.

Inspection of University of Minnesota Experimental Engineering Laboratories

An inspection of the Experimental Engineering Laboratories at the University of Minnesota featured the November meeting of the Minnesota Chapter. Prof. F. B. Rowley, director of the Laboratories, demonstrated the hot box method of determining heat transmission. The chapter extended an invitation to the society to meet in the twin cities during the summer of 1929.

Wisconsin Chapter

The central station heating system at the University of Wisconsin was the principal topic for discussion at the November meeting. The system was described by Mr. Novotney, chief engineer of the station. It was decided to hold monthly noon and evening meetings of the chapter, the noon meetings to be featured with local speakers, and the evening meetings by outside speakers.

Philadelphia Chapter

New officers of the Philadelphia Chapter, nominated at the December meeting, are: President, R. V. Frost, Norristown; vice-president, Benjamin W. Wilson, Philadelphia; treasurer, E. N. Sanbern, Philadelphia; secretary, A. J. Nesbitt, Philadelphia. Board of governors; Stephen S. Whitby, Lee Nusbaum and Raymond E. Jones.

The principal speaker at this meeting was Elwood S. White, of the Thermal Appliance Company, New York, whose subject was domestic water heating.

St. Louis Chapter

New officers of the St. Louis Chapter, elected at the November meeting, are: President, Walter Moon; first vice-president, F. J. McMorran; second vice-president, V. Rossman; secretary, C. G. Buder, and treasurer, E. H. Quentin.

Dean Anderson, Guest Speaker at Detroit

The third Michigan Engineering Conference, sponsored by technical organizations, civic groups, and individuals in the State of Michigan, was held at the Hotel Statler, Detroit, January 27 and 28. Dean F. Paul Anderson, president, A.S.H. & V.E., addressed the convention on the subject of "The Heating and Ventilating Engineer Is On His Way." Dean Anderson told his hearers in a colorful way of the part the heating and ventilating engineer is playing in the rapid development now going forward in that industry. He also outlined the unsolved problems now facing the profession, and told of the research work being carried out in an attempt at their solution.

Progress of Boiler Rating Movement

In a statement of the activities of the A.S.H. & V.E. Committee on the Rating of Low-Pressure Steam Heating Boilers, Chairman Alfred Kellogg refers to the suggestion made by boiler manufacturers and others, to the effect that the code should cover not only the determination of a one-figure rating value, but should define the minimum operating characteristics which should be determined for catalog data and should include the necessary test specifications for making these determinations. In accordance with this suggestion, the committee has drawn up a tentative extension of the proposed code which was incorporated in its report at the society's annual meeting. Mr. Kellogg also made the interesting announcement that the Heating and Piping Contractors National Association had approved the committee's plan to incorporate in its report a scheme to cover the determination of the operating characteristics of heating boilers.

Although a committee of the American Boiler Manufacturers Association had been in conference with the A.S.H. & V.E. committee, no definite agreement, it was announced, has been reached. However, some tentative suggestions in connection with the proposed code made by the A.B.M.A. were offered for the consideration of the Boiler Rating Committee.

It was the opinion of the committee, at the close of its meetings, that it would be inadvisable to ask the society to give final approval to any code until all means had been exhausted of first obtaining the full agreement of boiler manufacturers and contractors.

Polytechnic Institute Raises Engineers' Degree Standards

Polytechnic Institute of Brooklyn has raised the standard of its engineering degrees by increasing the requirements for these degrees.

Previously the degree of civil, electrical or mechanical engineer has been granted upon the successful completion of four years of prescribed work. The degree of chemical engineer has only been granted upon the completion of five years of work. Under the new plan, which becomes operative with the class of 1932, which enters next September, the degrees of bachelor of civil, electrical and mechanical engineer will be granted at the end of the regular four-year course. The bachelor of chemical engineering will be granted at the end of a five-year course. Then upon the completion of one year of experience in the engineering field and upon completion of twelve semester hours' graduate evening work at the institute, the degree of civil, electrical, mechanical or chemical engineer will be granted; or, the engineering degree may also be gained by three years of approved engineering experience and the acceptance of a thesis. The granting of engineering degrees for men of the evening courses will be governed by similar requirements as those of the day courses, though here the engineering experience may be concurrent.

Evening Course in Domestic Oil-Heating Equipment at New York University

A special two-year course designed for men working in the offices of heating engineers, architects and manufacturers of oil-burning equipment, as well as those engaged in manufacturing and installing oil-burner equipment, has been made part of the evening engineering courses at New York University. The sessions are being held in room 306, 32 Waverly Place, New York, and are conducted under the direction of Harry F. Tapp, technologist, American Oil Burner Association.

The program for the remainder of the school year is as follows:

February 16—Introductory lectures by several leaders in the industry.

February 23—Chemistry of combustion.

March 1—Fuel requirements.

March 8—Problems, combustion and fuel.

March 15—Elements of electricity, d. c. and a. c.

March 22—Electricity applied to oil-heating equipment.

March 29—Oil-burner construction.

April 5—Types of oil burners.

April 12—Heat and heating systems.

April 19—Review and practical problems.

April 26—Installation and testing.

May 3—Testing oil burners with boilers.

May 10—Inspection and maintenance.

May 17—Types of oil burners.

May 24—Review and problems.

May 31—Concluding lecture.

Adoption of Heating Ordinances in Canada

City councils all over Canada have been faced with the necessity of regulating warm-air furnace heating installations. The very nature of the northern climates in Canada, it is announced, has forced action in this regard. Since satisfactory heating is required in this climate for periods of from six to eight months every year, the manner in which furnace installations are made should be of sufficient importance for city officials to consider very closely.

Vancouver already has passed a heating ordinance governing warm-air furnace installations in that district, and the city of Edmonton now has an ordinance under consideration.

In the United States heating ordinances based upon the Standard Code (for warm-air furnace heating) have been put into effect in Spokane, Columbus, Minneapolis, Indianapolis, Kansas City, Omaha, New Orleans, Fort Wayne, Youngstown, Greensboro, North Carolina, Cincinnati, St. Louis and Toledo.

Legal Decisions

Heating Sub-contractor's Lien for Extra Work Under Verbal Contract with Owner Under Pennsylvania Statute

A building contract for the construction of a residence provided that the contractor was to put in the house a heating plant for $815. The contractor sublet the work of installing it to the Reliance Heating Company, which put in the plant under a contract with the general contractor. While the plant was being installed, the owner entered into a verbal contract with the Reliance Heating Company to furnish and install a gas boiler, covering it with asbestos, for $232.50.

Both the general contractor and the heating company filed mechanics' liens for their respective claims. The general contractor's lien was paid. The owner's defense to the heating company's claim was the alleged failure of the general contractor to carry out his contract properly and put in a proper heating system. The Pennsylvania Superior Court held this defense insufficient, for the reason that the heating company was not privy to the contract between the owner and the general contractor.

The owner could not hold the sub-contractor with whom she has no contract for the failure of the general contractor to perform his contract. There were only two possible ways that such an action could be maintained by the owner under the contract made between the general contractor and the heating company. One would be on proof that the contract had been made on behalf of the owner by the general contractor as her agent, which did not appear to be the case; and the other that the owner was the only one interested in the delivery of the work and material.

The consideration for the building, including the heating plant, in the first instance was to pass from the owner to the general contractor. The sub-contractor did not figure in that. He could not hold the owner under that contract, whatever his remedy might be against the property, or under the Pennsylvania Mechanics' Lien Act, section 22; nor could the owner hold the sub-contractor for a failure on the part of the general contractor to comply with his contract, even though the cause of the failure to furnish a proper heating plant was the bad performance of the work by the sub-contractor. Although the sub-contractor agreed to furnish the heating plant according to the plans and specifications, that merely indicated what he was to do and not with whom he was to deal. His relations were entirely with the general contractor. If the owner had any wrong which should have been redressed, she should have looked to the general contractor, with whom she made the contract. She abandoned that remedy by paying the general contractor's lien. Reliance Heating Co. v. Barton, 88 Pa. Superior Ct. 270.

Claim for Extras Installed Without Written Order Disallowed

Where a contractor by written contract agreed to furnish and install all the heating, plumbing and electrical fixtures in a building, and the contract provided conditions under which "extras" should be supplied and installed and the method of payment therefor, evidence offered by the contractor to prove an oral contract to pay for additional work and materials furnished, which were not provided for in the written contract, was held inadmissible. This evidence would, it was held, show only an effort to enforce a parol agreement, altering and changing the terms of a written contract. The written contract provided that changes should only be made on written order of the owner or architect, and that claims for extras made necessary by drawings or otherwise should be made before proceeding with the work. Smith v. Dunbar Co., Oklahoma Supreme Court, 257 Pac. 282.

Steam Heat Company Held Entitled to Certificate of Authority to Issue Securities in Reasonable Amount

The Central Steam Heat & Power Company, pursuant to the provisions of sections 184.01 et seq. of the Wisconsin Public Utilities Law, applied to the Railroad Commission for authority to issue $50,000 common stock, $70,000 preferred stock and $180,000 bonds, upon two central heating plants, one at Port Washington and one at Plymouth. The application was denied because of the applicant's failure to substantiate its estimate of distribution efficiencies, of the number of customers, and of probable sales, and because acceptance of the company's engineering estimate would result in withdrawing from investors the protection required by the Wisconsin Stock and Bond Law. The Wisconsin circuit court reversed the order and directed the granting of the certificate of authority. The Railroad Commission appealed. The Wisconsin Supreme Court, Central Steam Heat & Power Co. v. Railroad Commission, 213 N. W. 298, now reverses the judgment of the circuit court, and directs the case to be remanded to the railroad commission to find and determine the amount of common stock, preferred stock and bonds reasonably necessary for the purposes for which they are to be issued, and having made such findings, to issue a certificate of authority accordingly.

The statutory duty of the Commission, when too large an issue of indebtedness is requested, is held to be to determine the reasonable amount, not to deny the application. The statute places upon the commission the duty to ascertain the amount of indebtedness that may reasonably be issued against the assets of the public utility. There is no power in the circuit court to direct the commission to find that a certain amount is reasonably necessary, where the commission has not acted upon the subject at all. Findings that too much is asked, that the project could not be financially successful, or that the securities would not be a safe investment, are findings outside the statutory field and do not answer the plain calls of the statute.

Tenant's Rights in Heating Plant Erected by Him

A tenant of premises, soon after entering into a lease, erected a heating plant, under an arrangement with the landlord that the tenant might remove the plant at the end of his term. The lease also contained the statutory short form covenant providing for the removal of tenant's fixtures. After this lease expired there was a series of new leases, for short terms, one or two years, each to begin at the expiry of the current lease. The premises were sold, and the purchaser sued for an injunction to restrain the tenant from removing the plant. The Ontario Supreme Court, Appellate Division, Globe Land Co. v. Heaslip, (1927) 3 Dominion Law Reports 604, holds that the action was properly dismissed. The court followed Badalo v. Trebilock (1924) 1 D. L. R. 465, 53 O. L. R. 359, where the same court held that when a tenant having the right to remove fixtures during his term arranges a new lease to begin on the termination of the existing lease, this does not necessarily deprive the tenant of his fixtures. It may simply extend the tenant's right to remove them to the expiry of the new term, which is merely an extension of the old. In each case it is a question of intention, express or implied.

In the present case it was held to be plain that the tenant never intended to give up the right he originally had to remove the plant, and the landlord never intended to acquire the tenant's right to the plant by anything that took place upon the granting of the new leases. The fact that the new owner bought without knowledge of the agreement did not deprive the tenant of his rights.

AIR CONDITIONING
Calculations for a Typical Theater
(Continued from Data Sheet No. 20-M)

REFRIGERATION CAPACITY IN TONS

To compute the total refrigeration capacity required to remove all heat necessary to maintain the inside temperature desired, calculations based on the formulae given in Table 4 may be used.

In this table each source of heat is separated and the amount of refrigeration in tons is computed for each loss, the total aggregating some 217 tons. Another way of getting at the same quantity is to use the rule-of-thumb which allows 70 tons of refrigeration to every 1000 persons, this being reasonably accurate where no unusual features are involved.

TABLE 4

Heat Source	Formula	Substitution	Refrigeration – Tons –
Body Heat	$= \frac{S \times B}{T}$	$= \frac{3{,}000 \times 350}{12{,}000}$	= 88
Respiration	$= \frac{S \times P \times L \times R}{T}$	$= \frac{3000 \times 0.106 \times 1000 \times 0.75}{12{,}000}$	= 20
Roof	$= \frac{A \times t \times d}{H.C. \times T}$	$= \frac{100 \times 112 \times 0.57 \times 25}{2 \times 12{,}000}$	= 7
Walls	$= \frac{A \times 2 \text{ Sides} \times t \times d}{T}$	$= \frac{112 \times 60 \times 2 \times 0.24 \times 25}{12{,}000}$	= 7
Electricity	$= \frac{W \times w}{T \times f}$	$= \frac{100{,}000 \times 3.415}{12{,}000 \times 4}$	= 7
Fresh Air Make-Up (Latent Heat of Humidity Removed)	$= \frac{C.F.M. \times m \times g \times L \times R}{G \times T}$	$= \frac{25{,}000 \times 60 \times 2.57 \times 1000 \times 0.75}{7{,}000 \times 12{,}000}$	= 35
Fresh Air Make-Up (Dry Air)	$= \frac{C.F.M. \times m \times d \times R}{F \times T}$	$= \frac{25{,}000 \times 60 \times 31 \times 0.75}{55 \times 12{,}000}$	= 53
TOTAL REFRIGERATION TONNAGE			217

In the above table:

S—Seating capacity of auditorium, including standees.
B—Body heat in B.T.U. per hour.
T—Tons of refrigeration in B.T.U. per hour.
P—Pounds of water respired per person per hour.
L—Latent heat of water per pound in B.T.U. per hour (approx.)
R—Percentage of recirculated air.
A—Area of surface.
t—Transmission of heat in B.T.U. per square foot per hour, per degree difference in temperature.
d—Degrees of temperature range.
H.C.—Hung plaster ceiling; approx. one-half transmission.
W—Watts of electric current.
w—B.T.U. per watt, or 3.415.
f—Electrical factor, approx. one-quarter load.
m—Minutes per hour.
g—Grains of water condensed per cubic foot of air.
G—Grains of water per pound.
F—Cubic feet of air raised 1° F. per B.T.U.

(Continued on Data Sheet No. 20-O)

AIR CONDITIONING
Calculations for a Typical Theater
(Continued from Data Sheet No. 20-N)

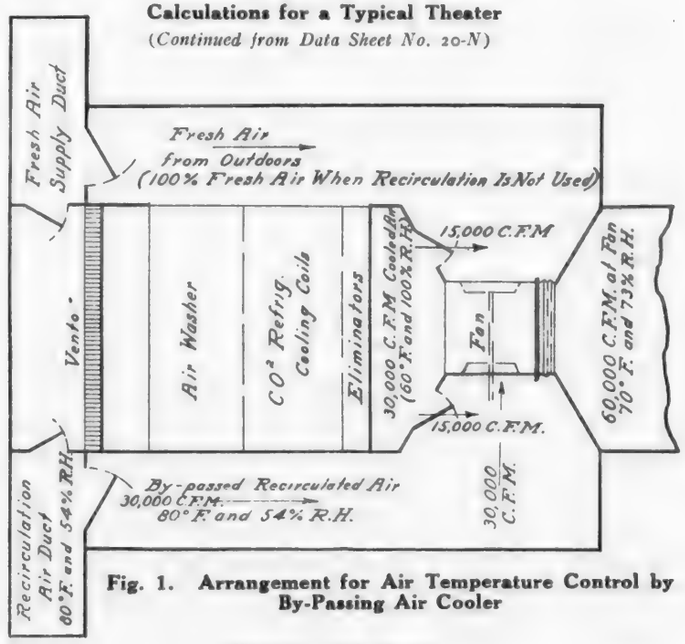


Fig. 1. Arrangement for Air Temperature Control by By-Passing Air Cooler

RECIRCULATION OF AIR

In cooling systems for theaters it is customary to recirculate about 75% of the air supplied to the auditorium and to add about 25% of fresh air. In other words, where 100,000 C.F.M. is put into the building only about 75,000 C.F.M. will be returned to be cooled, and the other 25,000 C.F.M. for make-up will be taken from the outside. Such treatment produces a slight pressure on the building and tends to make all leakage outward, instead of inward. This explains why, in Table 4, only 25,000 C.F.M. of air was used instead of 100,000 C.F.M.

BY-PASSING THE AIR COOLER

Exact control of the air temperature is best obtained by an arrangement involving the by-passing of the air cooler, as shown in Fig. 1. In this scheme the outside air is brought to one side of the heater and the recirculated air to the opposite side. If outside air is being used altogether (as may be the case in winter) the air simply passes through the heater and air washer in the customary manner; when recirculation is going on (and assuming that the total air being delivered to the theater is 60,000 C.F.M.) half of the air is passed through the cleaning and heating or cooling apparatus and the other half is by-passed around the outside; these are mixed before entering the fan inlet.

(Continued on Data Sheet No. 20-P)

Tribute to Edwin S. Hallett and the Ventilation of the St. Louis Schools

UNDER the title of "The Hoosier Schoolmaster Who Introduced Seashore 'Climate' in St. Louis Schools," the *St. Louis Globe-Democrat* for December 18, 1927, in its magazine section, extols the work of Edwin S. Hallett, chief engineer of the St. Louis Board of Education in connection with the ventilation of the St. Louis public schools. The article, written by a staff writer, Harry R. Burke, includes a portrait of Mr. Hallett in colors.

"When Edwin S. Hallett," states the writer, "became chief engineer for the St. Louis Board of Education ten years ago, he became interested in a problem of purely economic engineering. In the then new school buildings there were being constructed air-waste vents, which of themselves for brick work and incidentals added something like $65,000 to the cost of a building. Air was pumped into the school, heated, and driven out. The initial cost of $65,000 for those vents was staggering. Added to that was the cost of continually reheating the air.

"Hallett believed something might be done with the air in St. Louis schools by means of ozone. If he could just put that active form of oxygen into the service of the schools he could revitalize the heated air that had once swept across the schoolroom, return it and use it again without the cost of reheating. Also a $65,000 bill for waste-air vents would be saved in the cost of each building. On the other hand, all ventilation practice in America was against the use of ozone. It seemed to be a failure. Could it be they were using too much? Ozone exists in the atmosphere in the proportion of about one part to 1,000,000. That is immeasurable.

"After he had done his thinking Hallett bought a $350 ozone machine, paying for it himself. He didn't want to ask the Board of Education to foot the bill for his experiments, particularly when those experiments were in a direction in which other engineers said it was hopeless to go.

"He erected that machine in a school where there was already an air washer; where the air was being washed and heated and driven across the rooms and out. Now the air, heated and washed and ozonated to a perceptible minimum, was driven through the rooms and returned to be used again. Strangely enough, body odors, the smells of garlic and of dust disappeared from the school. Teachers who had begged to be transferred on account of their health said that now they were as fresh at night as when they came to school in the morning. Children studied better and behaved better. Coughs and colds almost disappeared. An influenza epidemic occurred. Not one case developed in that school."

The article tells of a series of tests of school ventilating systems, some of which have been presented in THE HEATING AND VENTILATING MAGAZINE, indicating the benefits to the school children of the adoption of Mr. Hallett's ideas. It then goes on to tell how the use of ozone was applied successfully to the swimming pools in the Roosevelt and Beaumont schools, making it possible for 750 persons to bathe each week for nine weeks with no replacement of the water. "As for Engineer Hallett," concludes the article, "he's a scientist and 'impractical,' and was a school teacher, to boot. What does he get out of it? Partly the satisfaction of knowing that he's a pathfinder in a new science of engineering, partly the pleasure of knowing that his job is well done, and partly the joy of realizing that those who came to scoff when first he told of his work now stand astonished at the reality of those daily trips to mountain and sea shore without even leaving the city. But most of all the reward is in this:

" 'I am confident,' he says, 'that there are at least 200 teachers and pupils in St. Louis schools alive to-day who would have been dead before now under the old system of ventilation. After all, you know, there's a real reward in knowing your dream has saved those lives.' "

Effects of Building Insulation on Heating and Ventilation

In a study made by Samuel R. Lewis, of the heat-transmitting values of various building insulating materials, he shows a number of practical applications of such data.

For instance, a 4-in. stud wall of the ordinary frame house is practically as good a heat stop as a 9-in. thick plastered brick wall. Adding 4-in. of brick outside of the studs changes the heat resistance very little. A 12-in. thick uninsulated limestone wall loses considerably more heat than does a 9-in. brick wall. A concrete wall, thickness for thickness, is a poorer heat stop than is a stone wall.

Any of these can be improved about one-fifth by adding ½-in. of blanket or board or 2-in. of fill, while 1½-in. of cork or 3½-in. of fill will improve the wall as to heat transmitting capacity, almost one-half.

Considering wood floors with cold below, so often met with for bedrooms over cold porches, a wood floor of one thickness without any ceiling below is pretty bad, but the loss can be halved by a lath and plaster porch ceiling, and can be halved again by insulation placed between the joists.

A concrete floor on the ground is a cold floor. When it is a slab in the open, with air under it so that it becomes dry, it improves about 10%. An air space with a suspended ceiling below the concrete halves the heat loss, and this can be halved again by adding insulation.

A concrete roof transmits heat rapidly; more rapidly than the floor because the air at the ceiling is always much warmer than the area at the floor, and, since figures are per *degree* difference in temperature between the air spaces on the two sides, the total amount of heat lost at ceilings is usually far in excess of that lost at floors.

The effect of insulation, therefore, is much more noticeable when applied to ceilings or roofs than when applied to walls or floors, and insulation here gives the most rapid return on the investment.

Insulating a 4-in. concrete roof with 1½-in. cork reduces the unit loss almost 75%, and insulating a 1½-in. thick wood roof reduces the unit loss about 66 2/3%.

In any heated room there are always downdrafts caused by cooling surfaces, and updrafts caused by heating surfaces. A room which is insulated all around is easy to ventilate because the air can be directed from inlets to outlets. Windows, cool walls, and hot radiators, upset this orderly direction and bring about chaotic air currents.

In many cases the up and down drafts, due to cooling surfaces and radiators, can be used to advantage in assisting air movement in pockets or recesses, but in general the advent of building insulation has been most beneficial to the ventilating engineer.

The Weather Vein, in the Christmas issue, features a story of gathering and preparing the moving pictures that are released bi-weekly as the Paramount News Reel. *The Weather Vein* is the house organ of the Carrier Engineering Corp., Newark, N. J., and the yarn is spun by Esten Bolling. That "manufactured weather" is largely responsible for some of the almost inconceivable feats of the newsreel makers, is evident from the data given. How, otherwise, could an exposed reel of film be received at the laboratory, and, in 80 minutes be "on the screen" as a printed, developed, edited, titled, finished positive? To further agitate the brain of the amateur photographer who has struggled to develop and dry films over-night in summer, the story recounts how, after moving-picture films of the American Legion Convention in Paris had been rushed, via airplane, to New York, only 17 minutes was required in which to select the vital pictures and have 280 "still" prints ready for distribution to the Associated Press newspapers.

Heating and Piping Contractors National Association

Urges Separate Organizations of Heating and Plumbing Contractors

IF the industries of heating and plumbing are to measure up to their opportunities it is highly advisable that there should be separate organizations of local associations in the plumbing and heating fields. This statement was made by President Harry M. Hart, of the Heating and Piping Contractors National Association, speaking before the Presidents' and Secretaries' Conference of the National Trade Extension Bureau, at Pittsburgh, Pa., January 9. Mr. Hart made the point that there are some 9000 trade associations in the United States in other industries, all bending every effort to furthering the business interests of their particular groups.

"That we have come into an era of keen industry competition — industry competition from outside our own field—" he argued, "is very evident. If we, as plumbing or heating contractors, wish to keep pace with and compete against these other groups, we must all work together for the advancement of our own business interests."

Mr. Hart quoted figures to show that there is a total of 746 cities in the United States having a population of over 10,000. He then showed that the plumbing field is represented by not more than 100 to 150 locals, while the heating field is represented by some 31 locals, several of which were formed during 1927. He argued from this statement that both the master plumbers' and the heating contractors' associations have a serious organization problem with which to deal.

"It appears to me," he said, "that both organizations have a big fertile field to develop. We have a problem of making stronger locals out of our present local organizations. Then we have to reach out and establish locals in those districts where at present none exists.

"It also appears to me that neither group has analyzed nor studied this problem in as thorough a way as it should. Take it for granted that we have not—that is no reason why we should not give the subject of organization our early attention. The more I look into this subject the more interesting it seems and the more thoroughly I am impressed with the opportunity of expansion.

"In some districts it is advisable to form organizations that take in a group of towns in close proximity in order to have enough members to form an active local.

"Neither association, up to this time, has had anyone devoting his time to organization work. It is a matter that has been neglected in both groups. I am happy to say, however, that the Heating and Piping Contractors National Association has just engaged a man for that purpose.

"The advancement and preservation of our business interests should warrant both groups making investments in field representatives. In my estimation both groups will profit, not only in membership growth, but we will bring about the establishment of more active working locals which will deal with their business affairs in a thorough way.

"The leading business minds within both the plumbing and the heating industries recognize that plumbing is a distinct business from heating, and heating a distinct business from plumbing, and experience has clearly shown that in so far as association activities are concerned the best results are obtained when they are treated as such.

"In many localities there are men engaged in both lines of business. Regardless of that fact it is no reason why there should not be separate plumbing and heating locals. If such an arrangement of separate locals is established in every district we will see the plumbing business given more attention from the association standpoint, and you will see the heating business furthered.

"In fact, we should have the two groups working for the establishment of sound, well-organized locals throughout the country—these locals to work to the end that they are furthering the business interests of their members."

Annual Meeting to Be Held in Philadelphia

Announcement has been made that the 39th annual convention of the Heating and Piping Contractors National Association will be held in Philadelphia, June 4-7, 1928. Headquarters will be at the Bellevue-Stratford Hotel.

Directors Hold Winter Meeting

One of the important actions taken at the winter meeting of the board of directors of the Heating and Piping Contractors National Association, held in New York, December 5-6, was the adoption of a plan to engage a field representative to promote the use of certified heating. Herbert A. Snow, chairman of the Committee on Certified Heating, reported that eight cities have now been licensed under the national association program. Several additional cities have taken steps toward adopting it.

The resignation was announced of William H. Driscoll as a member of the board of directors of the association. W. W. Hubbard, of New York, was appointed to represent the association on the Sectional Committee on Standardization of Pipe Flanges and Fittings, in place of Walter L. Fleisher, resigned.

At the time of the meeting of the board of directors, word was received that the heating and piping contractors of San Francisco were meeting at the same time to organize a local association.

Election was announced of eighteen new members of the association.

Appointment of Edward G. Byrd as Field Man

The announcement has been made that Edward G. Byrd, secretary of the Heating and Piping Contractors Norfolk (Virginia) Association and the master plumbers association of that city has joined the staff of the Heating and Piping Contractors National Association. He began his duties February 1. Mr. Byrd will represent the national association in the field and will devote his energies to assisting local associations in planning their programs and to extending the membership of the national association.

Edward G. Byrd

Mr. Byrd is well fitted for this work as he brings to it not only his experience in trade association work in Norfolk but a wide business and organization experience.

Before going to the Norfolk association he was assistant commercial manager of the Virginia Electric and Power Company in Norfolk. He has been prominent in the Veterans of Foreign Wars, having served as department commander of the Department of Virginia. He has been elected secretary of the Norfolk

Chapter of the American Red Cross for three successive terms.

During the war Mr. Byrd served with Battery B, 111th Field Artillery.

Plan of Training Workers Proposed by the Heating Contractors

Concrete data on the present status of training provisions in the heating industry of the work accomplished in 1927, with recommendations for the new year, are incorporated in a report of the Committee on Training of the H. & P.C.N.A. presented to the meeting of secretaries of heating contractors' local associations, in Pittsburgh, January 9-11. It was stated that there are in the United States approximately 3375 steamfitter learners; 745 or 22.7% of whom are in schools, and 27,750 journeymen steamfitters, 350 or 1.2% of whom are in schools.

There are 20 schools throughout the country that offer instructions in heating; only 16 or 10.7% of the 149 cities with a population of 50,000 and above have organized classes.

Special attention was directed in the report to the compilation of the "Standard Text on Steam Fitting" by the National Trade Extension Bureau with the co-operation of the H. & P.C.N.A. Committee on Training and others. This text was completed January 1 last and is now ready for distribution. It will fill a long felt need in the training program for learners in the heating industry. To offset the lack on the part of state teacher training institutions to train steamfitting instructors, T.E.B. has inaugurated an annual conference lasting two weeks, devoted entirely to such training. It is urged that local associations send their instructors to this conference for professional training.

Now that the text material has been published, local associations in cities of 50,000 population and above are urged to organize classes for the instruction of learners in the industry. It is also urged that local associations take the initiative in formulating joint apprenticeship commissions representative of all branches of the industry and of the local school system and that the details of local training programs be worked out and administered by this commission. Classes in all cases, it is added, should be under public control, conducted by the local public school system. Such a commission is needed to serve as an advisory body.

On the subject of foreman training, it is pointed out that the heating industry is beginning to recognize the importance of the supervision of men, materials and work. The foreman to a very great extent controls the efficiency of supervision. This is true whether the heating contractor is his own foreman or whether, as is the case in large organizations, special foremen are employed. The Foreman Training Service, concludes the report, can be secured by local associations without cost as state boards of vocational education, in co-operation with the federal board of vocational education, maintain a foreman training service which is available for the asking.

San Francisco Association Formed

At a meeting held at the States Restaurant, in San Francisco, December 19, steps were taken for the organization of the Heating and Piping Contractors San Francisco Association. Officers elected are: President, Curtiss N. Gilley, of the Gilley-Schmid Company; vice-president, W. D. Stewart, of O'Mara & Stewart; treasurer, James H. Pinkerton; secretary, E. L. Nattkemper, of James A. Nelson, Inc. Directors, in addition to the officers, are: Frank Knittle, of Knittle Brothers; W. P. Scott, of the Scott Company; Harry Mank, of the Gilley-Schmid Company; A. Atwood, of the Atwood Company; A. Leoni, of the Atlas Heating and Ventilating Company, and P. Wood, of the P. Wood Company.

Formulation and adoption of by-laws, planning for regular meeting dates, and other details, will be announced at some future date. In the meantime, committees are functioning to make the organization a helpful one.

Membership of the Norfolk Association Growing

Twenty-two heating contractors have been added to the membership of the Heating and Piping Contractors Norfolk (Va.) Association. These are: Bennett & Wickers, W. W. Breedlove & Company, Craft Brothers, R. D. Duell & Company, C. G. Harris & Company, Inc., Joseph J. Lawler & Company, B. F. Meginley Company, Inc., C. W. Perry, T. M. Rust, A. R. Thompson, Wilson Brothers, Inc., Billups & Ellington, Coley & Petersen, E. A. DeWaters, Inc., R. A. Emanuelson & Company, Inc., J. G. Lancaster, McGee & Sams, C. J. Montagna, A. D. Rapp, John J. Shanahan, W. E. Turner and C. L. Woodard.

Tentative American Standards for Pipe Fittings

Approved by the American Engineering Standards Committee, as of December, 1927, three tentative American standards have been issued by the sponsor organizations, The Heating and Piping Contractors National Association, Manufacturers Standardization Society of Valve and Fitting Industries, and the American Society of Mechanical Engineers. These standards are:

"Steel Pipe Flanges and Flanged Fittings," "Cast-Iron Screwed Fittings," and "Malleable Iron Screwed Fittings."

In a foreword to each of these there is told the story of the events leading up to this latest action, beginning with the adoption, in 1894, by the American Society of Mechanical Engineers of a standard flanged template. Unified action on the part of all interested parties became possible in 1921, when the American Engineering Standards Committee authorized the organization of a sectional committee on the standardization of pipe flanges and fittings. Each bulletin presents a sectional and external drawing of the fittings, together with essential dimensions in tabulated form. These bulletins are issued in Standard A.S.M.E. size, 7¾ in. x 10 in. x 10½ in. with from 12 to 24 pages of text matter. They will appear later in the form of data sheets in THE HEATING AND VENTILATING MAGAZINE.

Special Contest for Beal Medal of A. G. A.

It has been announced by H. W. Hartman, assistant manager and secretary of the Technical Section of the American Gas Association, that a special contest will be conducted every year for the Beal Medal. This medal, awarded for the first time in 1897, is given by the Beal family for the best technical paper submitted at the A.G.A. annual convention.

All members of the association have been invited to submit papers on technical subjects and a special sub-committee of the Technical Section will judge the papers and select three for presentation at the sessions of the section during the convention. The main condition specified has been that the subject shall cover original work on technical developments of fundamental importance to the industry.

Motion Pictures Portray Development in House Heating

The two-reel motion picture, starring Ann Pennington and telling the story of the Hoffman No. 2 vacuum valve, has proved so successful that the Hoffman Specialty Company this year will distribute for private showings its new film "Controlled Heat." This is said to be a dramatic, entertaining, and instructive film history beginning with the difficulties experienced by the cavemen and following, by successive steps, the development of the art of heating to the present time. It concludes with a demonstration of how progressive heating men sell Hoffman controlled heat to their companies.

Heat Transmission Through Boiler Tubes

The results of an exhaustive investigation to obtain data on heat transmission through boiler tubes, under conditions similar to those existing in an actual water-tube type of boiler, are embodied in Bulletin No. 168 of the Engineering Experiment Station of the University of Illinois. This study was carried on by Huber O. Croft of the station.

An important phase of this research was an analysis of the phenomena of water circulation under normal operating conditions. The general scheme of the tests was to generate steam in a boiler having a single water tube so arranged that water circulation occurred under conditions similar to those of an actual power boiler. The steam generated was condensed and weighed, and served as the basis for computing the heat absorbed by the tube. The heat was obtained by burning illuminating gas and passing the products of combustion parallel to the axis of the tube.

Sufficient data were obtained to correlate the heat-transmission coefficients with the rate of gas flow, the gas temperature, the velocity of the water in the tube, the temperature of the water, and the temperature of the tube.

Chicago Completes Big Pipe Tunnel

The proper distribution of steam and electricity underground was greatly advanced by the City of Chicago, when the Bureau of Engineering completed its reinforced concrete tunnel, located in the House of Correction grounds, 26th Street and California Avenue, Chicago.

The purpose of this tunnel is to supply heat, light and electric power to the New Cook County Jail Buildings, approximately 1700 ft. distant from the municipal power plant.

This tunnel was designed and constructed under the direction of Loran D. Gayton, city engineer, assisted by John Zielas, mechanical designing engineer, who was in direct charge of design.

It is 1680 ft. long, 9 ft. high, and 10 ft. 6 in. wide, housing one 16-in. low-pressure steam line, one 4-in. high-pressure steam line, and one 5-in. condensate return line, all equipped with American District Steam Company's expansion joints, which have added greatly to the simplicity of design and operation. All electric cables are carried in conduits encased in concrete, giving ample protection to the cables. The drainage and lighting of the tunnel have received considerable thought because of the daily inspection necessary to insure satisfactory service.

The time for the completion of the entire tunnel was five months.

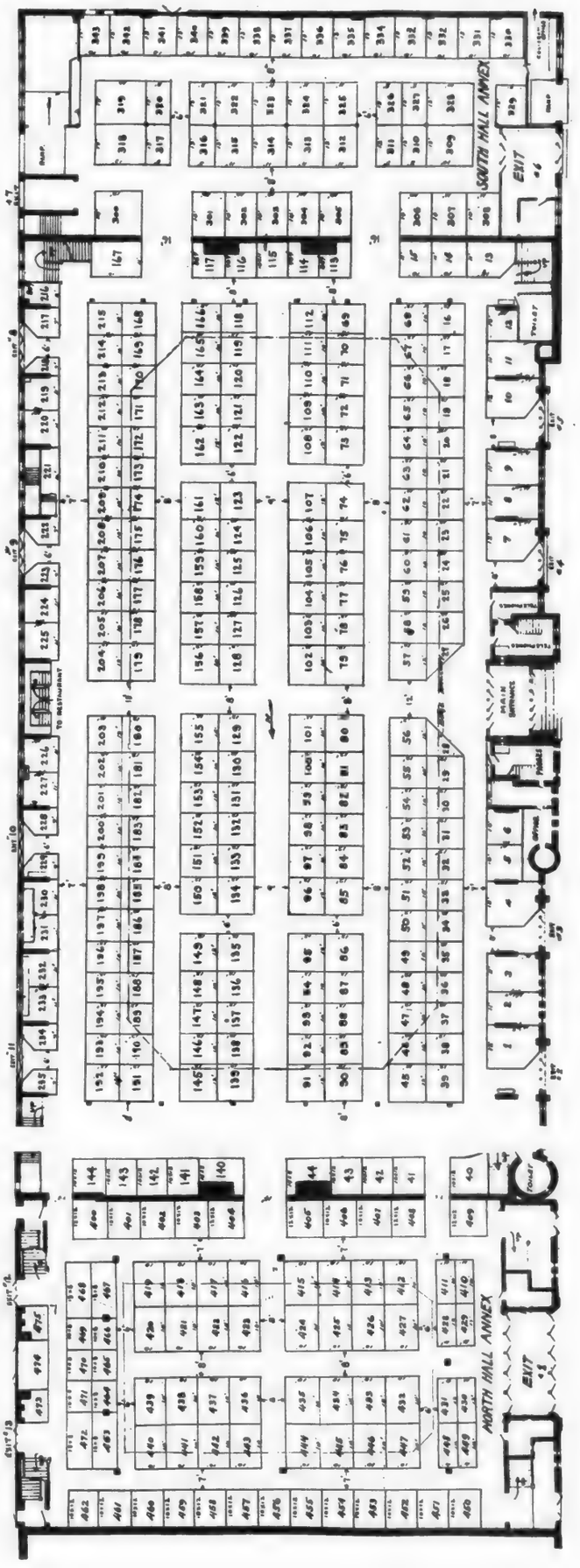


Diagram of Coliseum as Arranged for Chicago Power Show

Heating and Ventilating Exhibitors at the Chicago Power Show

Coliseum Building, Chicago, February 14-18, 1928

Booth No.	
459-460	Aerofin Corp., Newark, N. J.
166	Alexander Bros., Chicago, Ill.
91-93	Allis-Chalmers Co., Milwaukee, Wis.
8-9	American Blower Co., Detroit, Mich.
403-404	Armstrong Machine Works, Three Rivers, Mich.
137	Atwood & Morrill Co., Salem, Mass.
447	Auburn Stoker Corp., Chicago, Ill.
171-172, 211-212	Babcock & Wilcox Co., New York, N. Y.
213-215	Bailey Meter Co., Cleveland, O.
145	Bernitz Furnace Appliance Co., Boston, Mass.
309	Bristol Co., Waterbury, Conn.
421	Bros Boiler & Mfg. Co., Minneapolis, Minn.
16-17	Brown Instrument Co., Philadelphia, Pa.
123-125	Buffalo Forge Co., Chicago, Ill.
454-455	Bundy Steam Trap Co., Nashua, N. H.
189	Bethlehem Steel Co., Bethlehem, Pa.
312	Carrick Engineering Co., Chicago, Ill.
460-461	Carrier Engineering Corp., Newark, N. J.
4	Casey Hedges Co., Chattanooga, Tenn.
167	Cash Co., A. W., Decatur, Ill.
10	Celite Products Co., Chicago, Ill.
33-34	Chapman Valve Mfg. Co., Indian Orchard, Mass.
165	Chicago Chemical Co., Inc., Chicago, Ill.
1-3	Chicago Pump Co., Chicago, Ill.
226-227	Clarage Fan Co., Kalamazoo, Mich.
189-191	Cokal Stoker Corp., Chicago, Ill.
448-449	Compressed Spruce Products Co., West Orange, N. J.
156-157	Connery & Co., Philadelphia, Pa.
146	Cook Electric Co., Chicago, Ill.
63	Coppus Engineering Corp., Worcester, Mass.
121-2-162-163	Crane Co., Chicago, Ill.
225	Crosby Steam Gage & Valve Co., Chicago, Ill.
110-11-12	Cutler-Hammer Mfg. Co., Chicago, Ill.
86	Davis Regulator Co., G. M., Chicago, Ill.
420	Dearborn Chemical Co., Chicago, Ill.
228	Direct Control Valve Co., Chicago, Ill.
323	Dri-Steam Valve Sales Corp., New York City.
173-210	Dunham Co., C. A., Chicago, Ill.
11	Economy Pumping Machinery Co., Chicago, Ill.
5-6	Ellison, Lewis M., Chicago, Ill.
129-30-154-5	Fairbanks, Morse Co., Chicago, Ill.
37	Fisher Governor Co., Inc., Marshalltown, Ia.
160	Foster Engineering Co., Chicago, Ill.
183	Foster-Wheeler Corp., New York City.
61	Foxboro Co., Inc., Foxboro, Mass.
66	Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
150-1	Graver Corp., E. Chicago, Ind.
426-7	Griscom-Russell Co., Chicago, Ill.
441-2	Grinnell Co., Inc., Providence, R. I.
438-9	Harrington Co., Jos., Harvey, Ill.
313	Hays Corp., Michigan City, Ind.
338	Hill Co., E. Vernon, Chicago, Ill.

Booth No.	
65	Himelblau, Agazim & Co., Chicago, Ill.
138	Illinois Stoker Co., Alton, Ill.
405-6	Illinois Engineering Co., Chicago, Ill.
401	Instant Water Heater Div., Chicago, Ill.
472	Insulating Products Co., Chicago, Ill.
202	Jenkins Bros., Chicago, Ill.
300	Johnson Service Co., Chicago, Ill.
64	Kelly Valve Co., Chicago, Ill.
402	Kieley & Mueller, Inc., New York City.
66	Korfund Corp., New York City.
440	LaBour Co., Chicago Heights, Ill.
324	Linde Air Products Co., New York City.
454-5	Locke Regulator Co., Salem, Mass.
184-5	Lunkenheimer Co., Cincinnati, O.
229	Mabbs, John W., Chicago, Ill.
67-68	Manning, Maxwell & Moore, Inc., New York City.
465-467	Mechanical Mfg. Co., Chicago, Ill.
204	Midwest Piping & Supply Co., St. Louis, Mo.
340-1	Modine Mfg. Co., Racine, Wis.
413	Morehead Mfg. Co., Detroit, Mich.
434	Multicell Radiator Corp., Buffalo, N. Y.
80-1-2	Nash Engineering Co., South Norwalk, Conn.
443	National Air Filter Co., Chicago, Ill.
301-2	National Tube Co., Pittsburgh, Pa.
20-21	Nelson Corp., Herman, Moline, Ill.
135-149	Northern Equipment Co., Erie, Pa.
115	Nuway Boiler & Engineering Co., Chicago, Ill.
423	Peabody Engineering Corp., New York City.
224	Permutit Co., New York City.
126-158	Pittsburgh Piping & Equipment Co., Pittsburgh, Pa.
85	Pope Co., Wm. A., Chicago, Ill.
230-1	Powell Co., Wm., Cincinnati, O.
451	Powers Regulator Co., Chicago, Ill.
180-1-2-3	Power Specialty Co., New York City.
450	Reed Air Filter Co., Louisville, Ky.
219	Refinite Company, Omaha, Neb.
326-7	Reliance Electric & Engineering Co., Cleveland, O.
70-1-2-3	Republic Flow Meters Co., Chicago, Ill.
337	Rome Brass Radiator Corp., Chicago, Ill.
26-27	Sarco Company, Inc., New York City.
60	Schutte-Koerting Co., Philadelphia, Pa.
116	Skidmore Corp., Chicago, Ill.
83-84	Stannard Power Equipment Co., Chicago, Ill.
205-6-7	Sturtevant Co., B. F., Chicago, Ill.
52-53	Swartwout Co., Cleveland, O.
143-144	Trane Co., LaCrosse, Wis.
149	Uehling Instrument Co., Paterson, N. J.
424-5	Vogt Machine Co., Henry, Louisville, Ky.
98-9-100-1	Walworth Co., Boston, Mass.
41-42	Warren Webster & Co., Camden, N. J.
318	Wing Mfg. Co., L. J., New York City.
48-49	Worthington Pump & Machine Corp., Chicago, Ill.
435	Wright-Austin Co., Detroit, Mich.

Plans for Ventilating the U. S. Capitol

In connection with the plans that are being made for the construction of a new ventilating system for the House of Representatives and the Senate Chamber in the Capitol, at Washington, a meeting of leaders in the ventilating field was held at the office of David Lynn, architect of the Capitol, to discuss the requirements in view of the recent developments in the ventilating field.

The deliberations of the conference took the form of three resolutions. In one a summer temperature of 80° F., with a relative humidity not to exceed 50% when the outside weather conditions were 95° F. dry-bulb and 78° F. wet-bulb, was specified as the desirable conditions to be maintained.

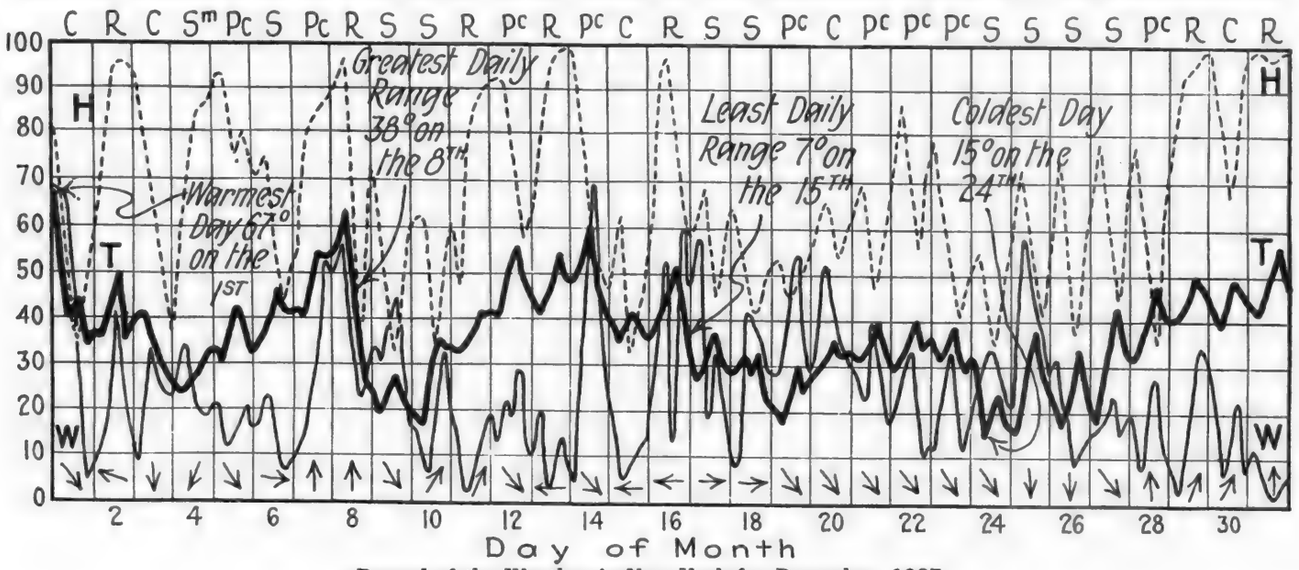
A downward system of ventilation was advocated by the conference, that is, with the air flowing from the ceiling toward and out through the floor, with careful provision for initial horizontal diffusion, capable of delivering a maximum of 60 cu. ft. of air per person per minute, and of variable capacity, through means of speed control of fans, to a minimum of 10 cu. ft. of air per person per minute, both figures being based on the figures of maximum occupancy of the chambers, and with temperature and humidity control adequate to meet the range and limits stated above.

It was recommended that comfort would most effectively be secured in cold weather by maintaining in the chambers a temperature of between 66° F. and 70° F., with a respective relative humidity of 50%-40%, and in warm weather by keeping the temperature 10°-15° below the outdoor temperature, with a relative humidity not over 50%.

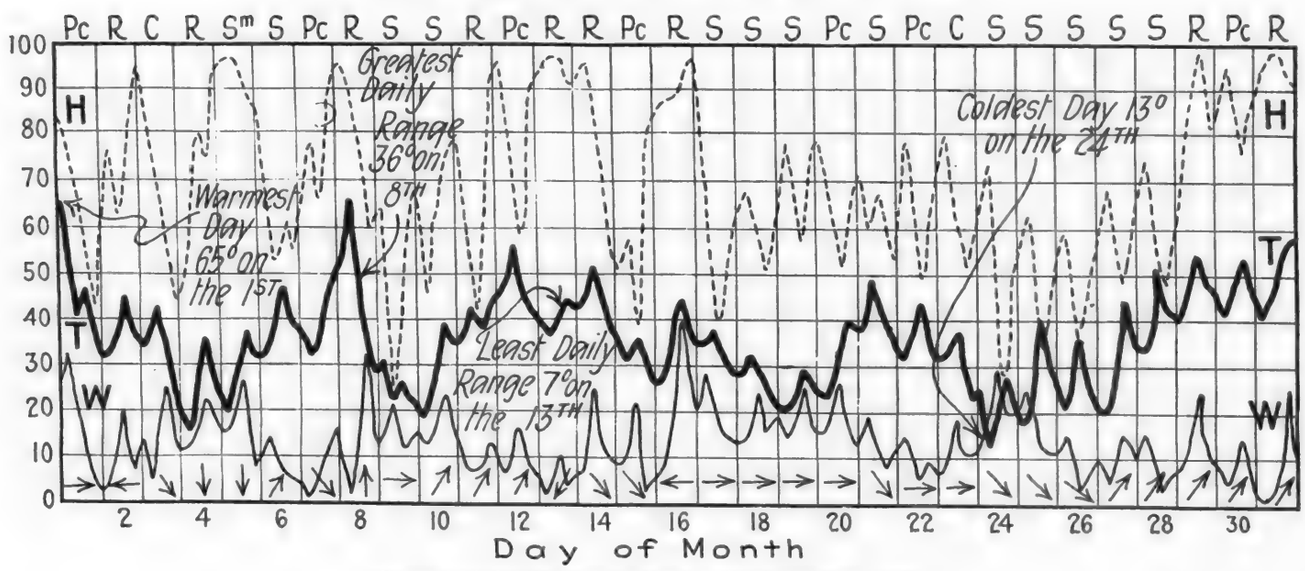
Those who attended the conference were: Prof. C.-E. A. Winslow, chairman; F. R. Still, New York; Frank Irving Cooper, Boston; A. M. Feldman, New York; D. D. Kimball, New York; Prof. A. C. Willard, Urbana, Ill.; R. E. Hall, David Lynn, Dr. R. R. Sayers, Washington; Dr. L. R. Thompson, Washington, and Dr. Leonard Greenburg, New Haven.

The Weather for December, 1927

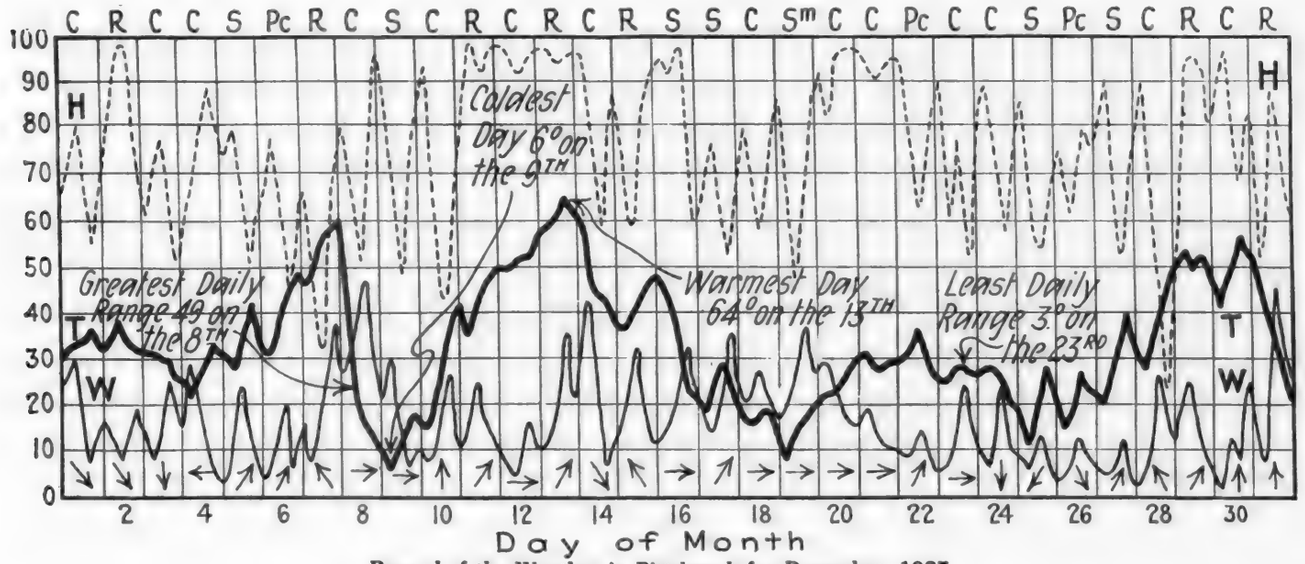
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	67	65	64	52	63
Date of highest temperature	1	1	14	12	12
Lowest temperature, degrees F.	15	13	6	—1	—1
Date of lowest temperature	24	24	9	31	31
Greatest daily range, degrees F.	38	36	49	43	50
Date of greatest daily range	8	8	8	7	7
Least daily range, degrees F.	7	7	3	3	9
Date of least daily range	15	13	23	18	14
Mean temperature for month, degrees F.	36.6	36.0	33.7	26.9	32.4
Normal mean temp. for month, degrees F.	35.0	32.5	34.2	28.8	34.9
Total rainfall, inches	3.39	5.22	3.16	2.74	2.31
Total snowfall, inches	2.4	Trace	1.6	10.0	2.5
Normal precipitation, this month, inches	3.45	3.41	2.73	2.07	2.23
Total wind movement, miles	16178	8973	10262	9698	10624
Average hourly wind velocity, miles	21.7	12.1	13.8	13.0	14.3
Prevailing direction of wind	N.W.	W.	W.	S.W.	N.W.
Number of clear days	9	10	5	9	16
Number of partly cloudy days	10	9	4	8	3
Number of cloudy days	12	12	22	14	12
Number of days on which rain fell	11	10	12	9	9
Number of days with snow	2	2	2	5	1
Snow on ground at end of month, inches	None	None	Trace	9.1	2.3


C R C Sm Pc S Pc R S S R Pc R Pc C R S S Pc C Pc Pc Pc S S S S Pc R C R
Greatest Daily Range 38° on the 8TH
Least Daily Range 7° on the 15TH
Coldest Day 15° on the 24TH
Warmest Day 67° on the 1ST
H
T
W
100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

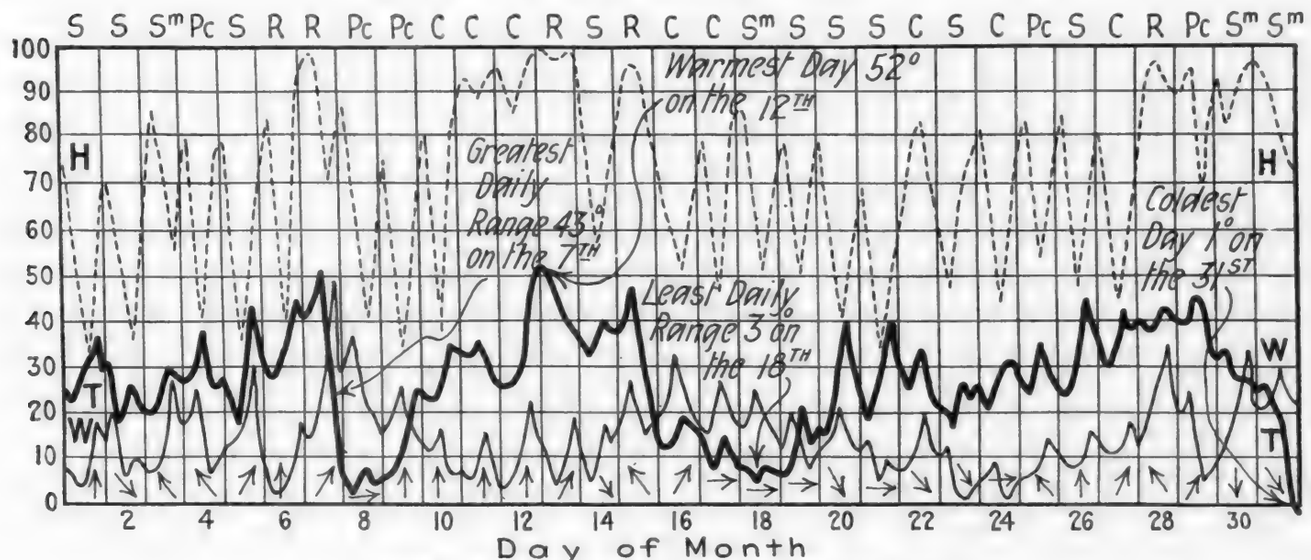
Record of the Weather in New York for December, 1927
(Hourly Observations of the Relative Humidity Plotted on this Chart)


Pc R C R Sm S Pc R S S R Pc R R Pc R S S S Pc S Pc C S S S S S R Pc R
Greatest Daily Range 36° on 8TH
Coldest Day 13° on the 24TH
Warmest Day 65° on the 1ST
Least Daily Range 7° on the 13TH
H
T
W
100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

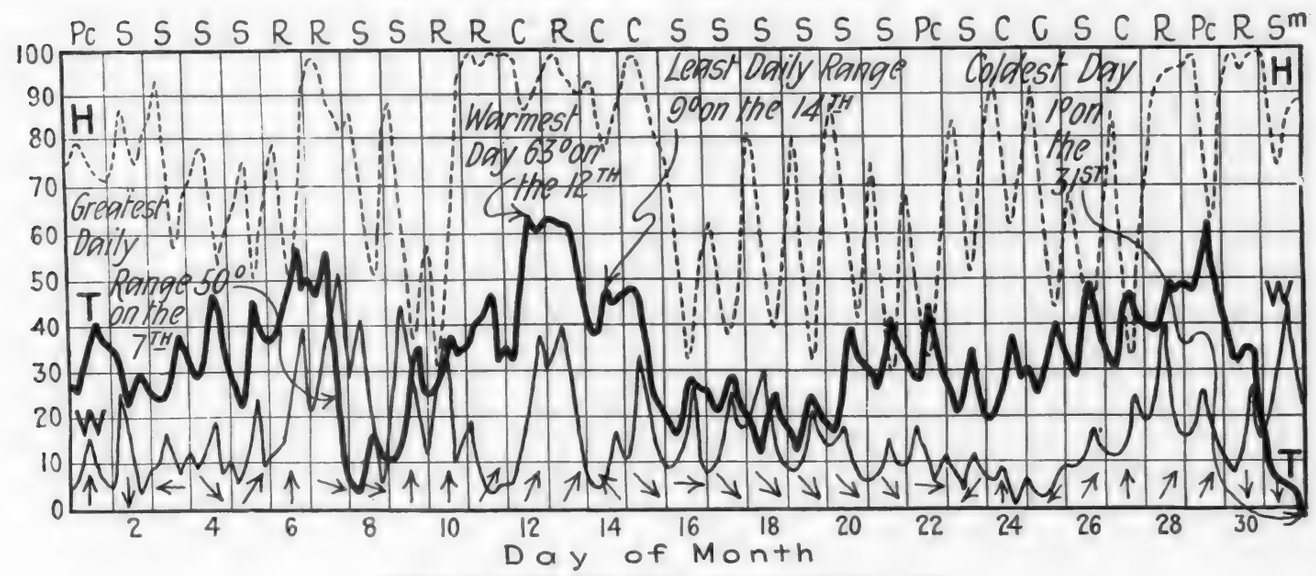
Record of the Weather in Boston for December, 1927


C R C C S Pc R C S C R C R C R S S C Sm C C Pc C C S Pc S C R C R
H
T
W
Coldest Day 6° on the 9TH
Greatest Daily Range 49 on the 8TH
Warmest Day 64° on the 13TH
Least Daily Range 3° on the 23RD
Day of Month

Record of the Weather in Pittsburgh for December, 1927


S S Sm Pc S R R Pc Pc C C C R S R C C Sm S S S C S C Pc S C R Pc Sm Sm
H
T
W
Warmest Day 52° on the 12TH
Greatest Daily Range 43° on the 7TH
Least Daily Range 3 on the 18TH
Coldest Day 1° on the 31ST
Day of Month

Record of the Weather in Chicago for December, 1927


Pc S S S S R R S S R R C R C C S S S S S S Pc S C C S C R Pc R Sm
H
T
W
Greatest Daily Range 50° on the 7TH
Warmest Day 63° on the 12TH
Least Daily Range 9° on the 14TH
Coldest Day 1° on the 31ST
Day of Month

Record of the Weather in St. Louis for December, 1927

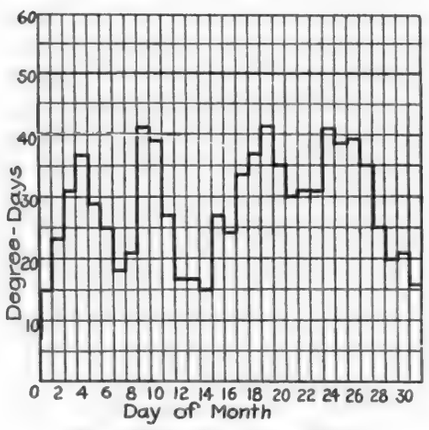
Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M.
S—Clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

Monthly Heating Loads in Degree-Days In Five Typical Cities

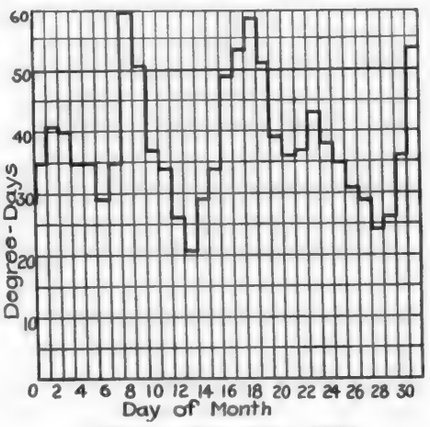
THESE charts show graphically the heating load in New York, Boston, Pittsburgh, Chicago and St. Louis.

The integration of each monthly curve is given in degree-days; also the total heating load for the current heating season, to date.

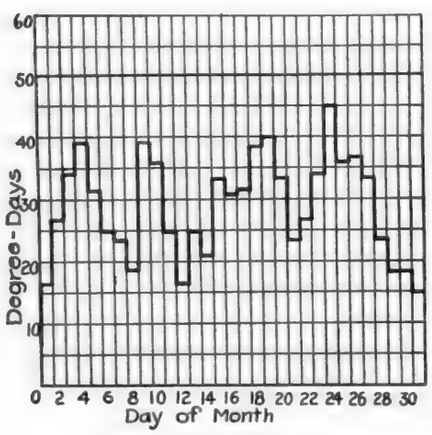
The December issue contained the first charts in the series. They are so drawn that the continuous heating load for any city can be built-up by cutting out the several charts and pasting them along a pencilled base line. The story of this method of measuring the heating load, and some of the many applications, will be found in THE HEATING AND VENTILATING MAGAZINE for September and November, 1925.



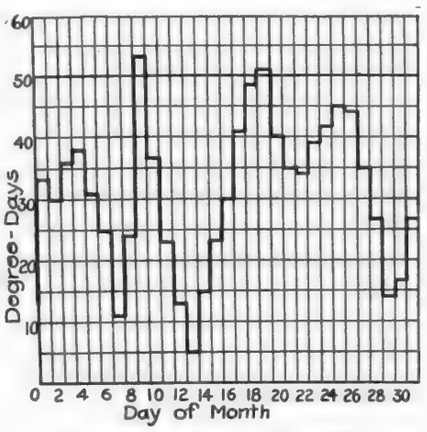
New York, December, 1927
Degree-Days 879—Degree-Days to December 31, 1603



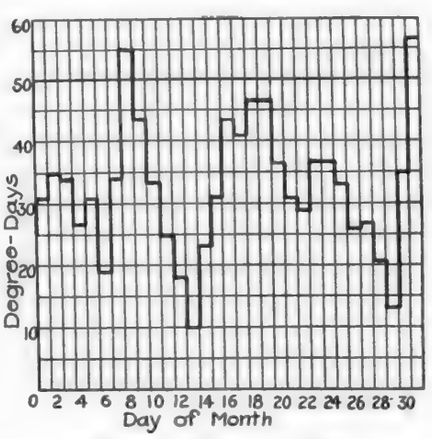
Chicago, December, 1927
Degree-Days 1181—Degree-Days to December 31, 2072



Boston, December, 1927
Degree-Days 899—Degree-Days to December 31, 1621



Pittsburgh, December, 1927
Degree-Days 971—Degree-Days to December 31, 1777



St. Louis, December, 1927
Degree-Days 1009—Degree-Days to December 31, 1630

Movement to Clarify Heating Specifications

In an effort to clarify and remove ambiguities in the non-conducting insulation sections of heating, ventilating, plumbing and refrigerating specifications, the Asbestos Board of Trade is enlisting the co-operation of the building trade and offers the following suggestions:

1. We feel that it would be desirable to place in your specifications, under the heading of non-conducting insulation, all piping and apparatus to be insulated, rather than to separate the insulation requirements in various other subdivisions of the specifications, as is frequently done.

For instance, some specifications have the insulation requirements for the boilers under the heading of "Boilers"; and under the heading of "Smoke Breeching" appears another insulation requirement, etc.

If all the insulation requirements are placed under the heading mentioned above, it will eliminate the possibility of overlooking some items which eventually cause delay and controversy in the execution of the work.

2. It also is desirable to place that part of the painting specification applicable to insulated surfaces under the heading of "Non-Conducting Insulation," rather than to place this item under the general painting specification, as the painting of the insulation usually is taken care of by the insulation contractor.

3. We would like to suggest that you mention specifically the piping and apparatus to be insulated, where it is located and how it is to be insulated. A specification stating "*cover steam piping*" is too general. If it is desired to insulate all piping in the steam supply system, we would suggest that you state: "All steam supply mains and branches, including risers and radiator connections, are to be insulated."

If it also is desired to insulate all the return piping in the heating system, a specification reading: "All return mains and branches, including risers and radiator connection" would be clear and definite.

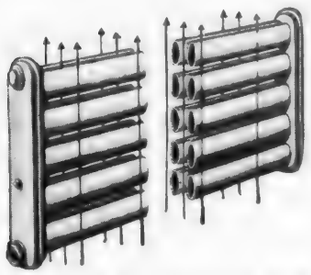
If certain portions of the supply or return systems are to be left uninsulated, this can be provided for by specifying: "All return piping, except the following, is to be insulated."

The foregoing also applies to insulation requirements in connection with ventilating, plumbing and refrigerating systems.

New Apparatus and Appliances

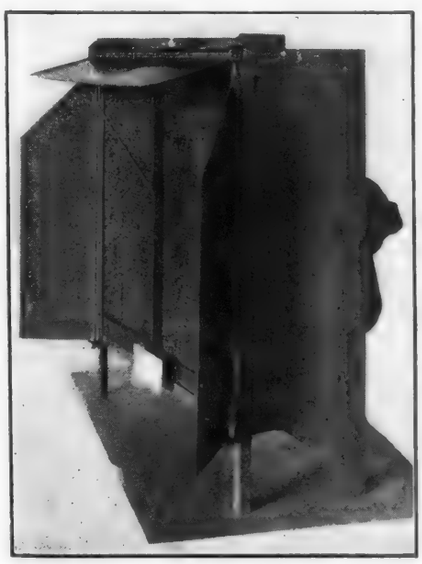
Novel Form of Oval Tube Radiator

An advance design of the Shaw-Perkins oval tube radiator, embodying an ingenious arrangement of the tubes to permit a free passage of air, is announced by the Shaw-Perkins Mfg. Co., Pittsburgh, Pa. The new model is known as the Shaw-Perkins high-convection radiator. Through their low narrow construction these radiators are featured as particularly adaptable for installation on walls, under windows, in recesses, upon columns or pilasters, and in greenhouses. They are made of Armco iron in single units up to 14 ft. in length and, being of one-piece construction, are free from mechanical joints. They are furnished with either legs or brackets.



Oval Tubes in Shaw-Perkins Radiator Reduce Air Friction

Due to their light weight, these radiators will find a wide application in both steam and water heating installations where the item of weight is a factor.

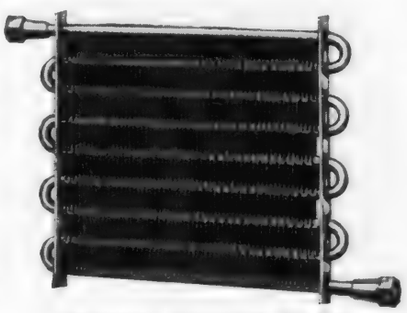


Lloyd Unit Heater

Wolverine Produces New Fin Tube Core

An interesting design of a fin tube core made of seamless copper tubing, designed particularly for use in fan system heating units, has been brought out by the Wolverine Tube Co., Detroit, Mich. The tubing is in one continuous length without joints, in that case eliminating the possibility of leakage. It is made with diameters of ¼ in., ⅜ in., ½ in., ⅝ in. and ¾ in.

To the continuous tube is applied a new type of fin which makes it possible to attain an increased fin surface per inch of tubing. At the same time care has been taken to provide for positive contact between tube and fin as tubing of any diameter and fins of any desired dimension can be used. The new core lends itself to the solution of a variety of fan heating problems. The fin tube, the company adds, also can be built to fit cases or housings of practically any shape or size. Arrangements have been made to produce this surface to blueprint or other specifications on a quantity basis for application to unit heaters.



Wolverine Extended Surface Radiator Unit

A Unit Heater with Novel Air Deflectors

A unit heater with an interesting arrangement of diffusing outlet dampers has been developed by the Lloyd Engineering Co., 84 Stephen St., Belleville, N. J. The heater is equipped with a cartridge-type copper radiator while the fan used is of the disc type, motor-driven. The arrangement of the dampers permits the air to be deflected to either side or up and down, and they also can be used to control the amount of air delivered. As the free opening through the heater equals approximately 58% of the face area, the frictional resistance is low. With an air velocity through the heater of 860 ft. per minute the static pressure is given as 0.08 in.

Arco Humidifying Device

Attractive Humidifying Device for the Home

Arco Health is the name given to a humidifying device that has been placed on the market by the American Radiator Company, New York. This humidifier consists of a graceful Grecian metal bowl with a small electric heater contained in the base. It is designed to evaporate sufficient water properly to humidify 3000 cu. ft. of space under normal winter conditions. It is supplied with an automatic safety switch but is non-automatic in action, and should be switched on two or three hours each day. Arco Health is 12 in. in diameter and 8½ in. high.

Ric-wiL Water Proof Conduit Filler

In an effort to produce an insulation for underground steam pipes which will be integrally water-proof, the Ric-wiL Co., Cleveland, O., has placed on the market "Dry-Pac" insulating filler. The company recommends the use of this filler with its Types F and DF conduit systems, when installed in wet soil, exceptional water hazards, or where the under drainage is difficult.

The filler follows the development, three years ago, by the same company of the Loc-lip conduit. It was evident, that, regardless of how thoroughly waterproof the conduit is made, no kind of insulation could be expected to function at its best efficiency, if steam pipes leak inside of the conduits; or, water gets in some way through the manholes; or, because of the natural dampness in the ground, especially if the steam has been kept turned off; etc.

Dry-Pac consists of long-fibre asbestos which has carefully been prepared from the crude state so as not to destroy its inherent strength or its remarkable efficiency as a heat insulator. A percentage of treated spongy material is mixed with the fibre to give it just the proper amount of resilience needed for packing material for this kind of work.

Dry-Pac, it is stated, will not corrode the pipe or metal with which it may

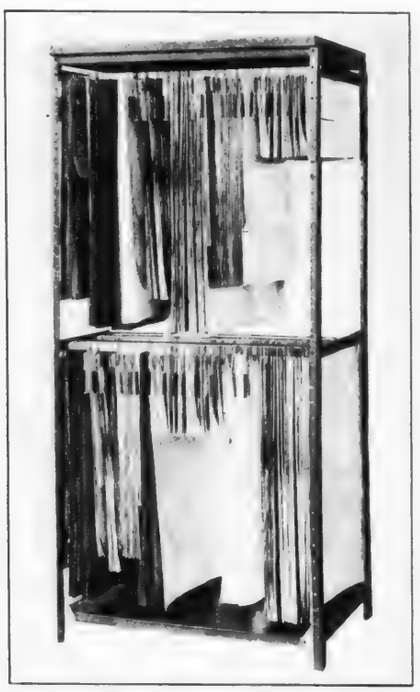
be in contact. As ordinarily packed in the conduit it weighs 8½ lbs. per cubic foot, at which density tests have proven it to be at its maximum thermal efficiency. Dry-Pac, it is further stated, is not affected by water at the boiling temperature.

Its heat loss is 0.36 B.T.U. per hour, per square foot, 1 in. thick, per degree difference at a mean temperature of 158° F.

Basic patents covering waterproof fillers for conduit systems and processes for same have been applied for by The Ric-wiL Company.

A New Filing System for Drawings, Maps and Plans

A number of novel and well-worked out features are embodied in a new filing system, designed particularly for drawings, maps and plans, now being



Steel Skeleton of Globe-Wernicke Cabinet for Filing Maps, Drawings and Plans

Sheets are hung from rods, and index tabs are conveniently located at the side near the top

manufactured by the Globe-Wernicke Co., Cincinnati, O.

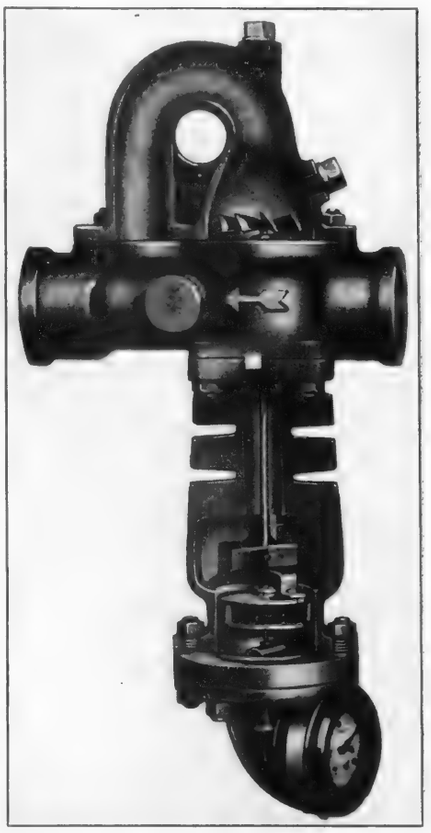
A steel cabinet, somewhat like a wardrobe, is supplied with hanging clips, each composed of a strip of celluloid enclosed in India rubber adhesive cloth. One end of the clip is attached by adhesion to the drawing. The other end contains a hole and slot that permits of suspending the sheet by snapping the clip over horizontal rods in the housing. Two or more clips are used for a sheet and the sheets are strung on an assembly of polished rods mounted just under the top of the cabinet. A set of riders is mounted on the rods, enabling the contents of the rack to be shifted laterally, making for easy access to any particular drawing. The drawings are handled by the clips and it is not necessary to touch the drawings or sheets when removing or replacing them.

A system of guide and index cards has been devised so that the location of any desired drawing may rapidly be found. The manufacturers state that the life of a drawing is materially lengthened and its usefulness increased by this method of filing, because there is no contact between adjacent sheets and no friction when pulling out or "tucking in" a sheet. As there is no necessity for handling the drawings, particularly at the corners, this method of filing avoids frays, folds and "dog-ears" at the corners. Provision is made for the filing of drawings of different sizes and filing may be done in numerical order or according to size.

The Shunt Steam Meter

To provide for accurate measurement of steam flowing through small pipe lines, such as those supplying residences with street steam, the Shunt steam meter has been placed upon the market by the Builders Iron Foundry, Providence, R. I. This meter is placed directly in the steam line and the total pounds of steam is read on a counter dial similar to that used in gas meters.

As its name implies, this meter shunts, or by-passes a definite proportion of the total steam flow, and this proportionate part of the entire steam flow is measured by means of a small turbine with vertical shaft, driving the counter gears. This eliminates moving parts from the main line of flow. Near the lower end of this shaft is mounted the damping fan which revolves in a chamber filled with water formed by condensation, keeping the turbine speed low. Thus the wear on all bearings is reduced and also the range of the meter is increased. The counter train at the lower part of the meter is driven by the turbine shaft through a permanent magnet, thus preventing the possibility of leakage of water into the counter chamber and avoiding stuffing box friction. The



Cutaway Shunt Steam Meter Showing Operating Elements

counter dial, which is vertical, can be arranged to face in any desired direction.

Should the operating range or working pressure be changed the meter can be adapted, at a slight expense, to the new condition if it is returned to the factory.

The meter is bolted in the pipe line at any convenient location with no more trouble than a length of pipe. It is a complete unit in itself without any independent parts or fittings; the steam may be turned on as soon as the meter is in place. It is made in 2-in., 3-in. and 4-in. sizes.

The meters are calibrated to read correctly for the particular pressure specified by the customer. In ordinary ser-

Special Clips for Filing in Globe-Wernicke Cabinet

Tab at left bears index number or designation

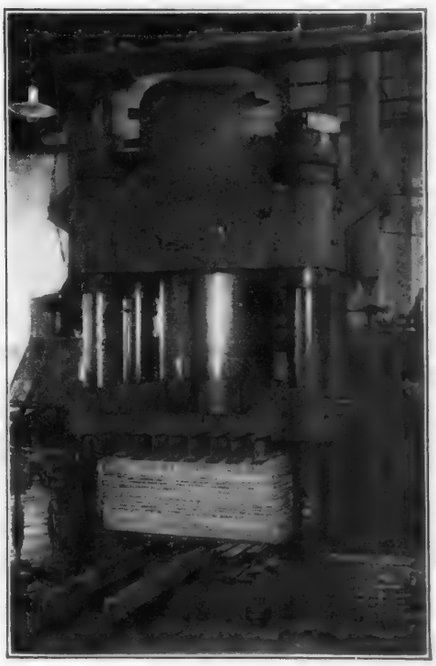
vice, unless this pressure varies excessively, no correction will have to be made, as ordinary pressure fluctuations will not alter the total reading over a reasonable period. Correction factors are furnished for pressure variations encountered in testing or in a temporary change of working conditions.

The meters can be calibrated for any desired pressure between 3 lbs. per sq. in. and 225 lbs. per sq. in., and rated capacities varying from 2200 lbs. of steam per hour to 27,600 lbs. per hour. A calibration curve on this meter shows that it starts to operate at approximately 1/40 of the full flow for which it is set, and that between 15% and 125% of its capacity, the error is substantially zero.

Sprucolite—Compressed Spruce Pulleys and Gears

Following several years of experimental work and manufacturing on the Pacific Coast, there was established by the Compressed Spruce Products Co., at West Orange, N. J., a factory for the manufacture of pulleys, gears and similar products from highly-compressed laminated spruce. Coincident with removal to a new factory at Bloomfield, N. J., February 1, the corporate name of the company will be changed to the Sprucolite Corporation.

The processing of these products is an extremely fascinating one. Sheets of spruce, approximately ¼-in. thick, are faced with special cement, and the required number of thicknesses, with the grain of adjacent layers at right angles, is placed on the platen of a hydraulic press and subjected to such compression that the fibres of the wood literally are squeezed together. The thickness of the laminations is reduced to about 50% of their original condition. This means that a 20-in. pile of sheets is compressed to about 10-in. in thickness. Under this pressure, the wood fibres from one lamination literally intermingle with those of the adjacent lamination.



Pile of Spruce Sheets on Hydraulic Press Being Compressed to One-Half Original Thickness for Manufacturing Sprucolite Products

Cutaway Showing Structure of Sprucolite Pulley

Large Pulley Built Entirely of Wood by the Sprucolite Process

Tests conducted by the University of Washington, Leland Stanford University, and other institutions, show that compressed spruce pulleys possess an exceptionally high coefficient of friction. Results from tests on the H.P. capacity per inch of belt on pulleys of compressed spruce and cast-iron, show that the former has more than 13% greater capacity than cast-iron, while the weight is about one-third that of an equivalent cast-iron pulley. A complete line of pulleys of various sizes will be carried in stock for the eastern market.

Small, Portable Recording Thermometer

To meet the increasing demand for a portable recording thermometer smaller than the existing sizes, the Bristol Co., Waterbury, Conn., announces such an instrument using a 4-in. chart.

The measuring element consists of a bi-metallic helix which is positive in operation and is extremely sensitive to temperature changes. The arm is attached to the measuring element, and records directly on the chart without any intervening or complicated multiplying devices. There is a sufficient pen arm to hold ink for a complete 72-hr. revolution of the chart. A specially designed Seth Thomas clock, having all parts plated with a rust-proof preparation, is incorporated. The clock key is permanently attached to the back of the instrument case so that the clock can be wound without removing the chart or interfering in any way with the continuous operation of the recorder. The instrument case is made of aluminum with either black or white enamel finish. It is available in several temperature ranges to meet such requirements as recording greenhouse temperatures, ice cream hardening temperatures; also for recording temperatures in dwellings, hotels, apartment houses, schools, etc.

Richardson Square-Cased Boilers

To meet the increasing demand for home equipment with high-class appearance, the Richardson & Boynton Co., New York, announces that a line of round-type steam and water boilers, with rectangular sheet-steel insulated casing, has been placed upon the market. The outer casing is finished with high-lustre blue Japan, which is durable, easy to clean, and will not crack or peel. The casing is lined with 1-in. 8-ply asbestos air cell attached to the casing when shipped. This assembly makes a unit easily kept clean and of such attractive appearance that it would not be out of place in a modernized basement that has been converted into a billiard room or playroom. It is available in sizes rating from 450 sq. ft. to 1250 sq. ft. of radiation.

Sectional View of Richardson Square-Cased Boiler

Summer and Winter Domestic Hot-Water Supply

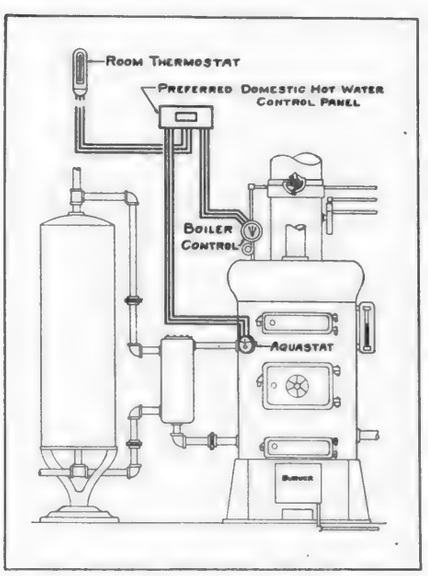
The advent of oil fuel for automatic house heating has stimulated a demand for automatic hot-water service. This has been met by the Preferred Utilities Manufacturing Company with a Preferred 100% multiple control panel,

Control Box for Preferred Hot Water Supply System

which is now available for the three-wire low-voltage control system. A panel for 110-volt circuits also is being developed.

The application of the low-voltage three-circuit panel, together with a view of the panel, are shown in the accompanying illustrations. Domestic hot water is heated by the circulation of hot water from the boiler around the copper coil in the indirect heater, which is connected with the hot-water storage tank and supply pipes.

An aquastat, placed in the steam or vapor boiler water, keeps the water hot but never permits it to give off vapor or steam unless the thermostat is calling for heat, in which case the thermostat takes the control away from the aquastat. If the thermostat is not calling for heat, no heat is supplied to the radiators even though heat is being supplied for domestic hot water.



Hook-Up of Automatic Water-Supply System Developed by Preferred Utilities Mfg. Company

With the Preferred multiple control panel, there are no valves to operate, or switches to throw. The heat and hot water service are fully automatic at all times during the year.

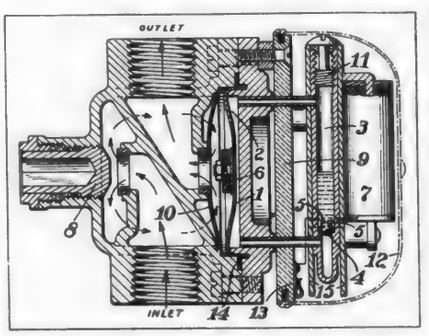
From information gathered in the field, in the summertime the oil burner is only operating a few times each day for short intervals to supply the hot water. The total operating time to furnish hot water will vary in accordance with the amount of hot water required, but from fifteen minutes to an hour and a half total operating time in twenty-four hours is a fair estimate under average conditions.

The use of the oil burner for heating hot water is not only economical in the purchase of equipment but also furnishes hot water at a minimum cost.

In addition to the advantage of having one central heating plant, is the advantage of using the equipment daily throughout the year which keeps it in prime condition and always ready for a cold day.

Thermo-Electric Temperature Regulator

A temperature regulator, in which a vapor pressure of about 20 lbs. for closing the valve may be generated in-



Operating Details of Thermo-Electric Temperature Regulator

stantly, at any desired room temperature, within a sealed diaphragm chamber of the valve bonnet, has been designed by the National Research Laboratories, 329 13th St., N.W., Washington, D. C. The mechanism operates by means of a sensitive trigger action of a small magnetic ball valve which consumes 1/20 watt per valve. It is actuated by a distant wall thermostat.

The lifting of this hermetically sealed-in ball when the group wall thermostat closes its circuit, allows a small charge of alcohol to flow freely from an air-cooled chamber of each valve fixed outside its bonnet, into the hot diaphragm chamber within the bonnet, thereby generating vapor pressure and expanding the diaphragm.

As long as the ball remains suspended allowing all condensation of alcohol to return freely to the hot chamber, the diaphragm pressure will hold the steam valve closed.

As soon, however, as the room temperature falls a fraction of a degree below the setting of the wall thermostat, the external magnetic coil circuit will be opened, dropping the ball to its seat, preventing further condensation from returning to the diaphragm chamber, and accumulating it in the outer cooled chamber, so that within a space of two minutes the diaphragm chamber will become dry and collapse, turning on the steam again.

All the valves in a building, it is stated, may be operated from a four-volt battery or a common bell transformer; one such transformer being sufficient to operate a 200-valve installation.

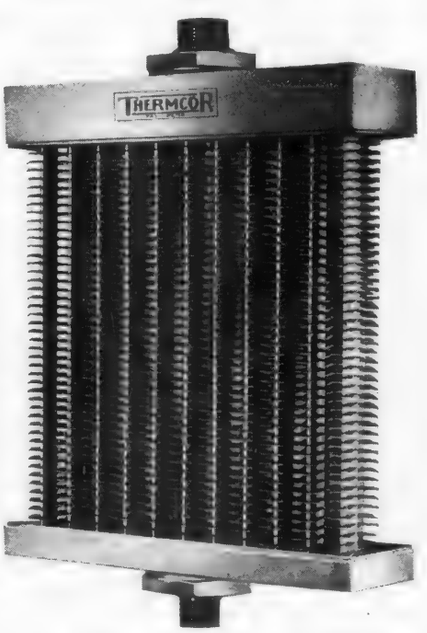
The diaphragm action for closing the valve is practically instantaneous; the regulator is adaptable for either one or two-pipe jobs.

The wall thermostat developed for this control is a single contact bi-metal designed to operate on a temperature differential of less than 1°.

Any number of radiators, it is stated, may be operated from a single thermostat.

Thermcor—An Extended Surface, Non-Ferrous Radiator

Having in mind the extensive field opened by the advent of unit heaters, laundry and clothes dryers, dry kilns, dry rooms, etc., the Thermal Radiator Corp., Marquette Bldg., Chicago, has produced a unit-heater radiator element embodying large extended surfaces and providing for free steam flow. Each section is formed without solder and consequently is not subject to leaks. Tanks and tubes are non-corrosive even with salt water. The units are designed for pressures up to 150 lbs. Detailed engineering data will be furnished upon application.



Unit Heater Radiator with Extended Surfaces Fabricated Without Solder

Present Accepted Practice in Domestic Oil Burners

Penberthy. *Centrifugal Atomizing, Mechanical Draft, Gas Ignition.*

Previous articles in this series are:

1. *Kleen Heet, July*, 1925.
2. *Baker, July*, 1925.
3. *Kerrihard, July*, 1925.
4. *Silent Glow, August*, 1925.
5. *Aetna, August*, 1925.
6. *Caloroil, September*, 1925.
7. *Oil-O-Matic, September*, 1925.
8. *Chalmers, October*, 1925.
9. *Hart, October*, 1925.
10. *Sun, October*, 1925.
11. *Rayfield, November*, 1925.
12. *A. B. C., November*, 1925.
13. *Electrol, December*, 1925.
14. *Grant, January*, 1926.
15. *Nu-Way, January*, 1926.
16. *Wayne, February*, 1926.
17. *May, February*, 1926.
18. *Ray Rotary, March*, 1926.
19. *Super Oil Heator, May*, 1926.
20. *Nokol, July*, 1926.
21. *Johnson, August*, 1926.
22. *Arrow, September*, 1926.
23. *Safe Fire, October*, 1926.
24. *Sword, November*, 1926.
25. *Hardinge, January*, 1927.
26. *Petro, February*, 1927.
27. *Sundstrand, March*, 1927.
28. *Northern, May*, 1927.
29. *Vesta, June*, 1927.
30. *Marr, July*, 1927.
31. *Aladdin, August*, 1927.
32. *Remington, October*, 1927.
33. *Rickard, November*, 1927.

34. Penberthy

DESIGNED to atomize by centrifugal force from a horizontal revolving disc, the Penberthy burner is manufactured by the Penberthy Injector Co., Detroit, Mich. This organization has been in existence nearly a half-century, producing steam specialties, and the burner is a finished product reflecting its background.

The burner is built as a single unit on a cast-iron bed plate, one end of which carries the ⅛ H.P. repulsion-induction motor driving the oil pump and burner head, the strainers, control valve, no-voltage release mechanism and the control motor, while the burner head, air-control sleeve, ignition and combustion chamber are at the opposite end.

THE BURNER HEAD

Installation is effected by leveling the bed-plate in such a position that the burner head is centered in the boiler combustion chamber, with the atomizing disc approximately at the grate level.

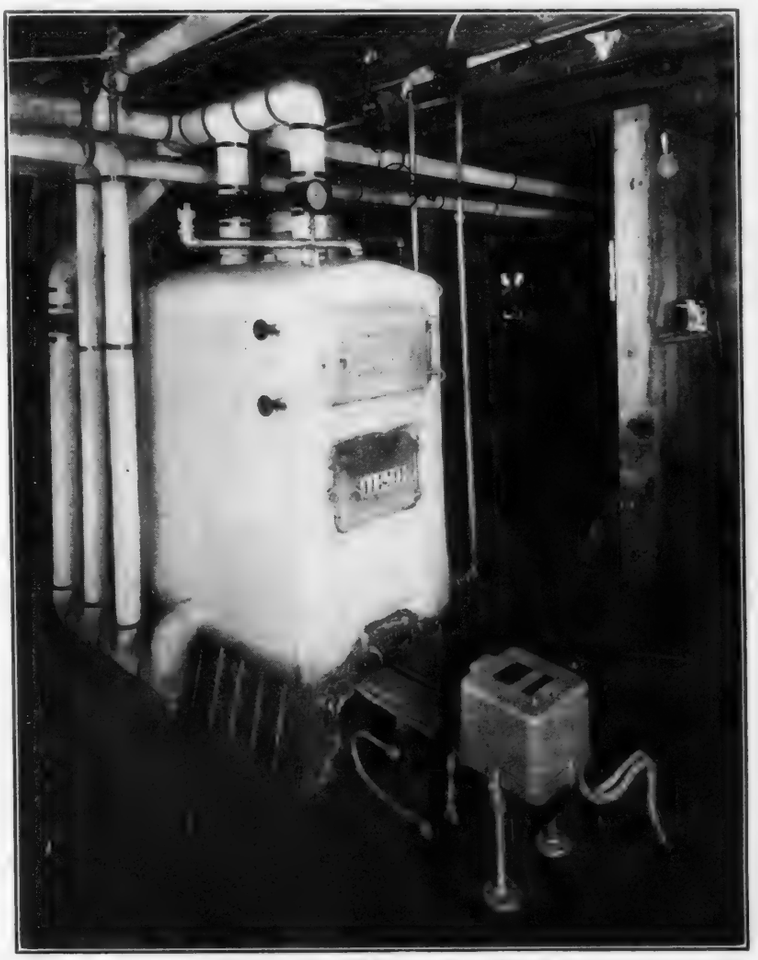
The vertical shaft carrying the disc is mounted on two adjustable Timken roller bearings; it is hollow, taking oil from a chamber at its base through sylphon metal bellows and delivering it to the top surface of the plate. Air is furnished, in a circular sheet just under the atomizing disc, by the action of blades forming an integral part of the disc, on its under side. An adjustable collar surrounds the blades, affording control of the air supply through a bell-crank and a rod extending to the outer end of the unit.

The horizontal shaft also is mounted on roller bearings, and is provided with a spring-type flexible coupling. An extension pipe from the bottom of the burner-head casing leads to the outer end of the burner, terminating in a vertical stand-pipe. Lubricating oil for the gears is introduced to the casing through the stand-pipe. This lubricant supply need be replenished but once a year, preferably at the beginning of the heating season.

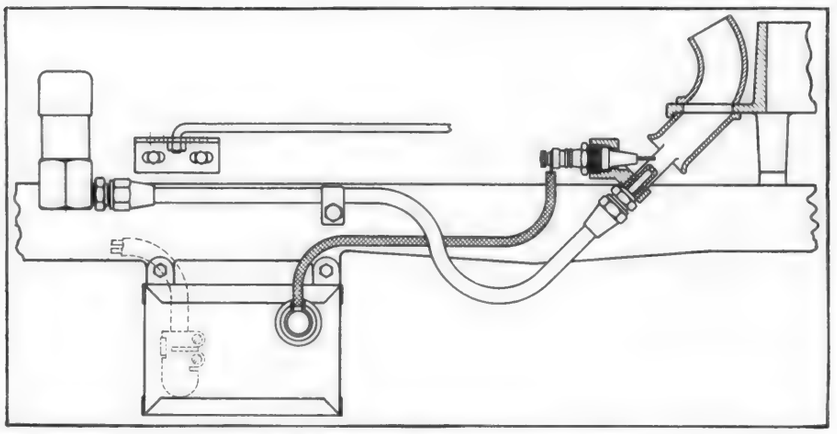
OIL PUMP, STRAINERS AND OIL CONTROL

An extension shaft, carrying a pinion driving the oil pump, is pinned to the end of the motor shaft. To its outer end is fastened one end of a spiral-spring flexible coupling, driving the horizontal shaft that extends to the burner head. A micarta spiral gear meshes with the pinion on the extended motor-shaft and drives the gear oil-pump. The pump gears revolve in a shroud that is cast integral with the center pump-spacer. Sylphon bellows prevent leakage from the pump casing to the driving-gear casing. A coarse-mesh strainer is attached to the suction side of the pump casing, and a fine strainer and air separator are interposed between the pump and the oil control.

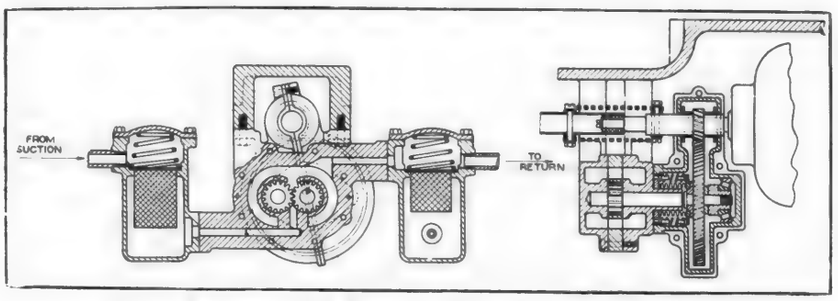
Oil, after leaving the pump and strainers, flows through a series of three valves, then through copper tubing to the base of the burner head, where it is introduced to the inside of the sylphon bellows. The first valve is merely a plug containing a fixed orifice, roughly limiting the maximum flow of oil according to the load for which the burner has been installed. There are several



A Penberthy Oil-Burner Installation



Detail of Penberthy Electric-Gas Ignition



Cross Sections of Oil Pump and Drive, Penberthy Burner

sizes of these metering plugs. The next valve is a limiting device of the needle type, operated by a key. This key is smaller than a standard hose key, and the valve stem is protected by an extended packing nut so that only a qualified person can change its adjustment. This is set by the installation man. A mechanically-operated valve, with inverted seat, opened by a cam on the control-motor shaft, and closed by the cam or by the no-voltage release, opens and closes the oil line when the burner starts and stops.

If the burner is not operating the action of the thermostat starts the control motor and rotates the cam on its shaft through a three-minute half-cycle. The cam, rotating from the closed position to the running position, one-half of a revolution, opens the oil valve and admits oil to the burner. As the cam passes beyond the point where it will hold the oil valve open, the valve lever is caught by a dog and held open. When the thermostat acts to shut down the burner, the cam completes the second half of its cycle, lifting the dog and closing the valve through the release of the lever. If the burner is in running position with the valve open, interruption of the line current will actuate the no-voltage device, which will, in turn, trip the dog and close the valve.

AUTOMATIC GAS VALVE AND IGNITION SYSTEM

A cam, similar to the oil-control cam, is mounted on an extension of the control-motor shaft, and through it the gas-control valve is actuated. This valve passes gas to the burner during the starting period. When the starting cycle has been completed the gas is entirely shut off, and remains so until the next start. The gas pilot is located in the floor of the combustion chamber, and the gas is ignited by an electric spark produced by a transformer taking current from the 110 volt mains. The spark is started by the control motor, slightly ahead of the admission of gas to the ignition chamber, and is maintained through the entire ignition period. The ignition point is well protected from the burner flame.

CONTROL AND SAFETY CIRCUITS

A room thermostat and a vaporstat, or aquastat, are interlocked to operate the control motor. The thermostat maintains complete control of burner operation unless this operation produces excessive temperatures or pressures in the boiler, when the boiler-safety device assumes control and shuts off the burner. In addition, a masterstat or other temperature-actuated device is used to so shut down the burner, in case of emergency, that a manual re-set is required. An interlocked stack safety, or combustion control prevents trouble that might come from ignition failure, and consequent burner operation without a flame.

BURNER CAPACITIES AND FUELS

Three sizes of burners are available, rated as follows:

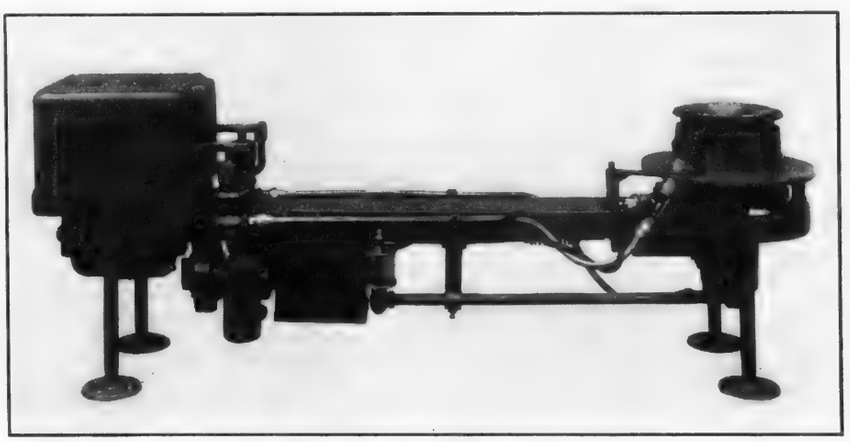
	Sq. Ft. Radiation
No. 3	up to 800
No. 4	2000
No. 5	4000
No. 6	8000

The Penberthy burner is listed by the Underwriters' Laboratories to burn oil not heavier than 36 A.P.I.

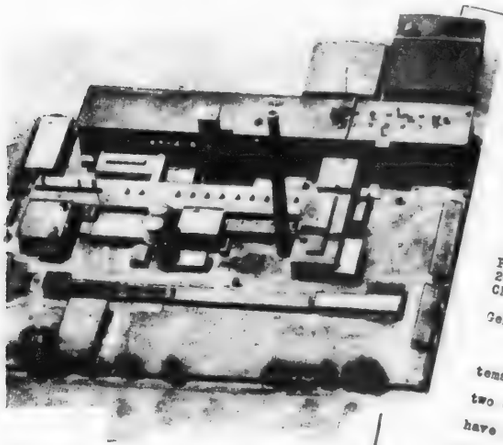
Insulated Jacket for Richmond Sectional Boiler

A new boiler design, incorporating a front-feed with the Model type of side-feed sectional boiler, is announced by the Richmond Radiator Co., 1480 Broadway, New York, under the name of the Magic Flame. The new boiler is of the cast-iron, vertical-section type and is notable for its low water-line, large combustion space and the amount of direct flue surface and free flue travel. Special pains have been taken in this design to secure smokeless combustion.

The boiler will be made in three sizes, with grates 15 in., 22 in. and 36 in. wide and with capacities ranging from 300 to 4500 sq. ft. for steam and from 500 to 7500 sq. ft. for water. It will be insulated with asbestos millboard under the jacket. Deliveries, it is stated, will begin about March 1. Certifications of efficiency and ratings are those determined by tests made by the Frost Research Laboratory, Norristown, Pa.



Penberthy Domestic Oil Burner



Jute Mill of the LINEN THREAD CO. at Kearney, N. J.

Chart below shows very accurate c ntrol obtained with Powers regulation at the mill above.

CABLE ADDRESS: "HREADERS PATERSON"

The Linen Thread Company,
Mechanical Department
GRAND ST. Paterson, N. J. Feb. 12, 1926.

Powers Regulator Co.,
2720 Greenview Ave.,
Chicago, Ill.

Gentlemen:-

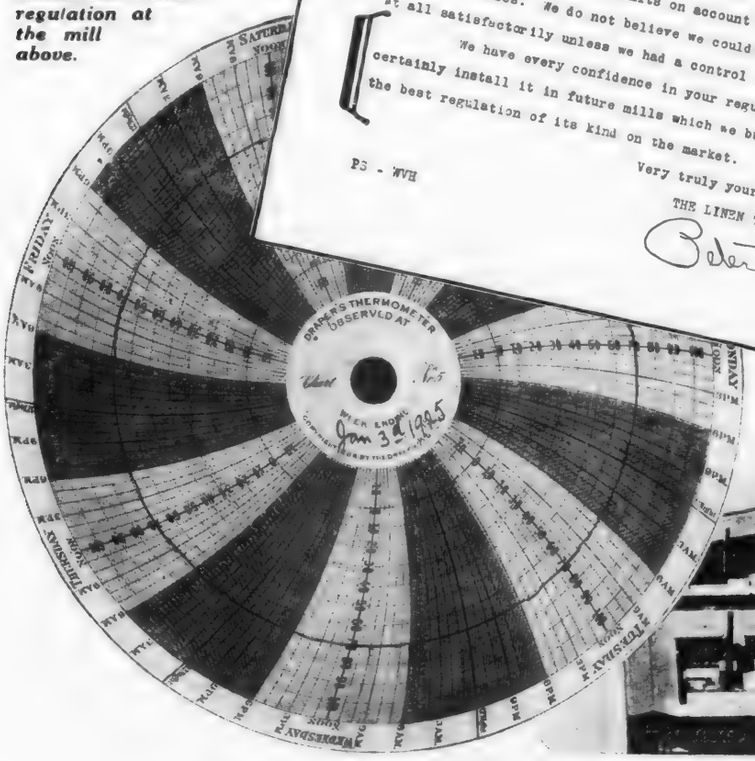
Some two years ago we investigated the different systems of heat control with a view to installing such systems in two of our mills. Would say that since that time installations have been made in the Finishing Department and Office at our Grand St. mill and in the entire new Jute Mill at Kearny, N. J.

We have kept accurate temperature records of heat in these rooms at various times and would say that the results accomplished by your control are certainly remarkable, particularly in our Jute Mill at Kearny where we need to control the temperature within very close limits on account of certain manufacturing processes. We do not believe we could have run this mill at all satisfactorily unless we had a control such as yours.

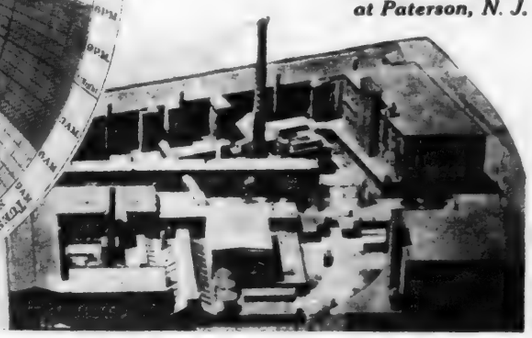
We have every confidence in your regulation and would certainly install it in future mills which we build, it being the best regulation of its kind on the market.

Very truly yours,
THE LINEN THREAD COMPANY
Peter Smith

PS - WVH



Grand Street mill of the LINEN THREAD CO. at Paterson, N. J.



THE POWERS REGULATOR CO.

36 years of specialization in temperature control

2718 Greenview Avenue, Chicago

New York, Boston, Toronto, Los Angeles, and 30 other cities.

(RC3597)

New Trade Publications

HICKMAN AIR SEPARATOR is featured in Bulletin No. 3 issued by the Western Engineering Co., 215 Market St., San Francisco, Cal. This device is designed to remove oxygen and other gases from water, thus preventing internal corrosion in pipes, boilers, condensers, and other equipment through which the

This Equipment Removes Air and Gases from Boiler Water by Centrifugal Force

water passes. This separator consists essentially of a vertical cylindrical vessel with annular jackets at the top and bottom. Water enters the lower jacket, and its entrance into the lower end of the cylinder is guided by a set of stationary drains which produces a whirling effect in the water passing up to the top of the cylinder and thence to the exit. Due to the centrifugal force of the rising and rotating water, many entrained gases, being of less density than the water, collect along the axis and rise in a straight line to the domed top, from which point they pass from the cylinder. The water loses much of its rotating movement when it reaches the top and passes out through sieve-like holes in the shell to the upper outlet jacket, to which the outlet pipe is flanged. In ordinary steam systems the Hickman separator is installed between the feed-water heater and the boiler, at which point the greatest quantity of dissolved gas has been liberated as bubbles.

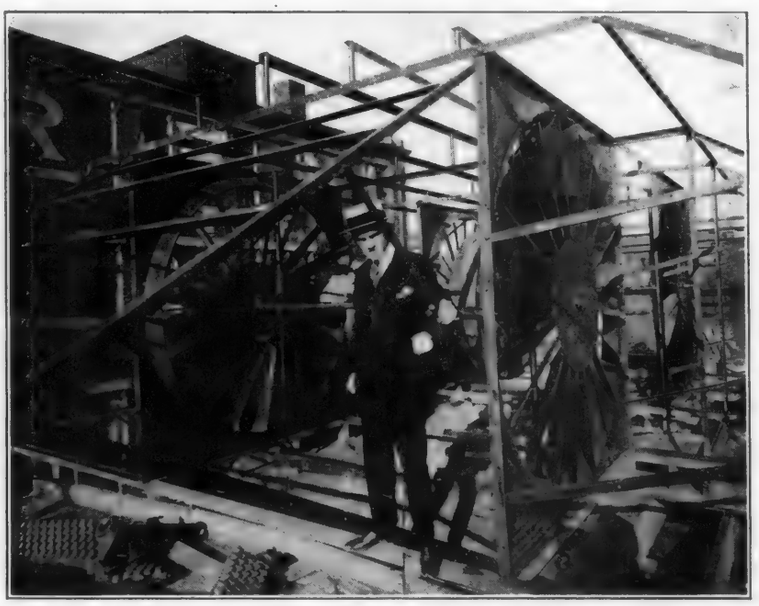
To protect hot-water systems in office buildings, hotels, hospitals, and similar buildings, it is recommended that the separator be installed at the top of the main riser before any distributing branches are taken off. This separator is manufactured for stationary purposes in a number of sizes varying between 1½ in. and 8 in. in outlet pipe sizes. As an example of the ability of this device to remove entrained air, it is stated that a separator with 2-in. inlet and outlet piping, used in an office building, removed 530 cu. in. of air and gases per hour.

TYPHOON VENTILATING FANS are described in an unusual catalog, issued by Typhoon Fan Co., 345 West 39th St., New York. A feature of this production is a section of 56 pages of exceptionally fine halftones showing interiors and exteriors of Typhoon equipped theaters, hotels, clubs, restaurants, churches, and other public and industrial buildings. These include the National Capital at Habana, Cuba; Mayflower Theater, Asbury Park, N. J.; Broadway Theater, Kingston, N. Y.; Jamaica Theater, Boston; Empress Theater, Omaha; Hotel Peabody, Memphis; Monticello Hotel, Norfolk, Va.; Park Avenue Synagogue, New York; American Sugar Refinery, New Orleans; Ford Instrument Co., Long Island City, N. Y.; Imperial Laundry, Seattle, and the Sanka Coffee plant, Brooklyn. The latter part of the publication is a catalog system in which a large number of typical designs for different kinds of theaters and public buildings are shown. Varying demands have been brought together into groups, and a typical installation worked out for each group. Then follows a technical description of the Typhoon fan, with concise information regarding its salient points, and tabulations giving both dimensional and operating data. Specialized arrangements of Typhoon fans also are described and illustrated, and one section is devoted to Typhoon air conditioning by refrigeration.

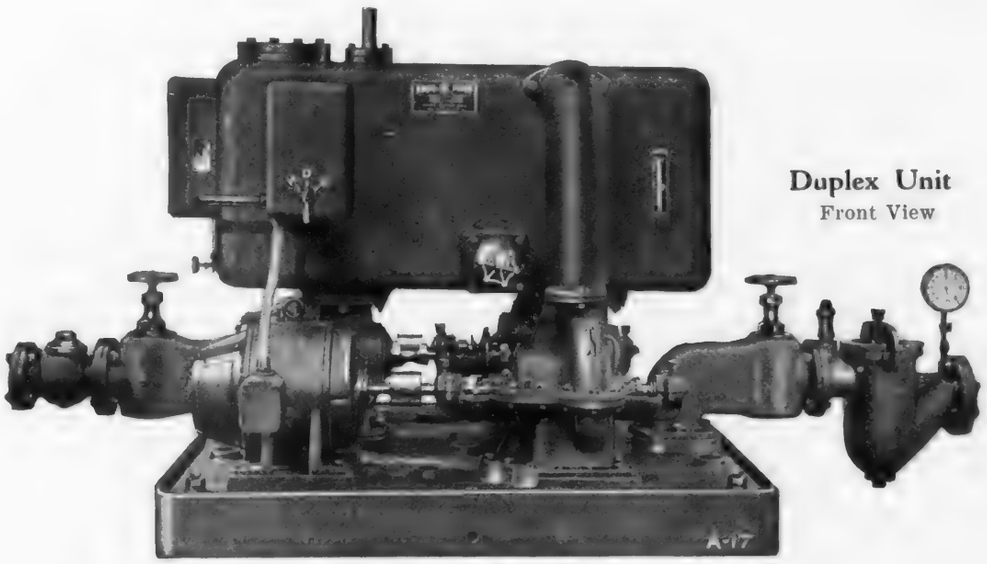
Taken all in all this is the most interesting and complete catalog of its kind that has yet been produced. Size 8½ in. by 11 in. Pp. 90.

TRIPLE-DUTY BOILERS are illustrated and described in a circular issued by Triple Duty Boiler Co., 4159 Cass Ave., Detroit, distributor for the Bass Foundry & Machine Co., Fort Wayne, Ind., manufacturer of this line. In presenting this boiler to the heating industry, the manufacturer calls attention to its similarity in design to the well-known Heine water-tube boiler used in industrial work. The triple-unit boiler is a steel water-tube type, built in accordance with the boiler code of the A.S.M.E. and is rectangular in shape with arched top. Three banks of tubes are set at such an angle that the desired circulation is obtained. By so arranging the boiler that it can be fired primarily with coal on the grate on one end, and with either oil or gas at the other, a compact double-purpose boiler is obtained. Grates at the opposite end to that used for coal firing can be used for the dehydration and incineration of refuse. The built-in hot water supply system consists of a submerged copper tube taking heat from the water immediately over the crown sheet. The catalog contains a complete tabulation of data on triple-duty boilers rated from 500 sq. ft. to 25,000 sq. ft. of steam, with equivalent water ratings.

HEIL STORAGE TANKS for oil fuel and other purposes are described in a bulletin issued by The Heil Co., Milwaukee, Wis. These tanks are built in various capacities from 300 gal. to 6000 gal. in the underground type and in much larger sizes for tanks to be installed above ground. The Heil Company also manufactures a complete line of highly-specialized fuel-oil truck tanks with pumps and heaters as required.



Typical Roof Installation of a Typhoon Cooling and Tempered Air Ventilating System in the Process of Erection



Duplex Unit
Front View

The AMES Pump

A Distinctively Different
Vacuum Heating Pump

Sold with a THREE (3) YEAR Guarantee

The simplicity of its hydraulic principle, combined with the ***utmost*** in ***modern pump design,*** assures maximum ***accessibility, durability*** and ***efficiency*** together with minimum ***installation*** and ***maintenance*** costs.

The outstanding performance of the ***Ames Vacuum Heating Pump*** has resulted in the consolidation of the ***Ames Pump Company*** and the ***Staten Island Shipbuilding Co.*** interests, thus providing unlimited manufacturing facilities at Mariners Harbor, Staten Island, New York, N. Y.

There are nine (9) standard sizes, in both ***single*** and ***duplex units,*** ranging in capacities from 5,000 to 150,000 square feet of radiation for ten (10) and twenty (20) pounds pressure.

Write for Bulletin No. 52-C, setting forth complete details of design, performance, efficiencies, etc.

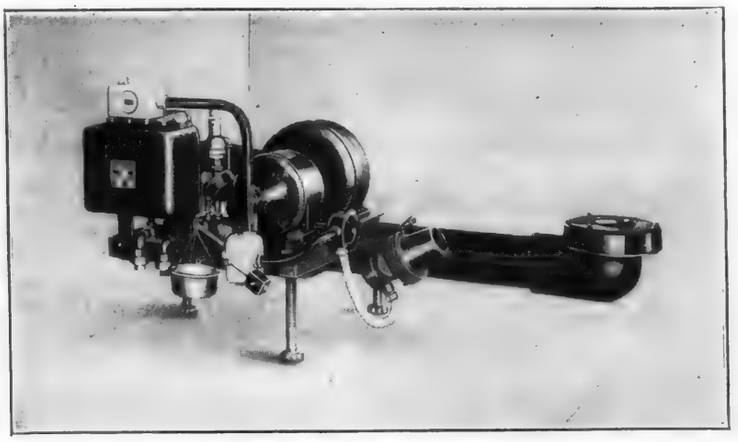
AMES PUMP COMPANY, Inc.

Division of STATEN ISLAND SHIPBUILDING CO.

90 West Street **New York, N. Y.**

Our sole aim is to serve the trade and its representatives better than they have ever been served before, and to continue to merit and hold its

C O N F I D E N C E

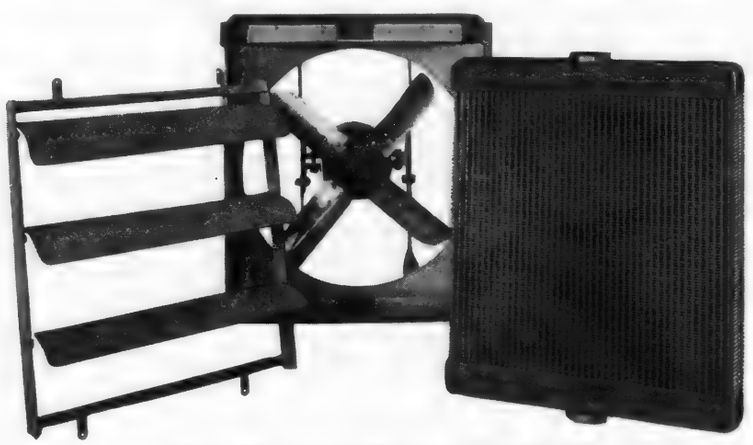


Fluid Heat Oil Burner

FLUID HEAT is the title of a very carefully-prepared booklet describing the Fluid Heat oil burner, manufactured by The Fluid Heat Corp., Baltimore, Md. This is a mechanical-draft, pressure atomizing burner in which the atomizing nozzle is located in the center of what might be called a "firepot," producing a vertical flame in the axis of the combustion chamber. The term "firepot" is not strictly a correct one, as combustion takes place above this part of the burner. Ignition is by either gas or electric spark. In the latter case, a transformer is used. Minneapolis controls are specified. A ¼-H.P. G-E motor drives the oil pump and blower. The burner is listed by the Underwriters for 28° A.P.I. oil.

MCQUAY HEAT CABINETS AND UNIT HEATERS are described in circulars received from the McQuay Radiator Corp., Minneapolis, Minn. One series of heat cabinets is designed for vapor vacuum and two-pipe steam systems and is cataloged in sizes equivalent to 9.5 to 99 sq. ft. of cast-iron radiation. The unit heaters consist of a rectangular frame work to which is fastened a four-blade fan driven by a standard electric motor and in which is set the extended-surface radiator. A third element, carrying a set of curved blades or diffusers, fastens to the face of the casing, completing the unit. A number of unique features are incorporated in the design and construction. Four models are listed, equivalent to 180 to 954 sq. ft. of cast-iron radiation. Roughing-in dimensions and general structural data are given.

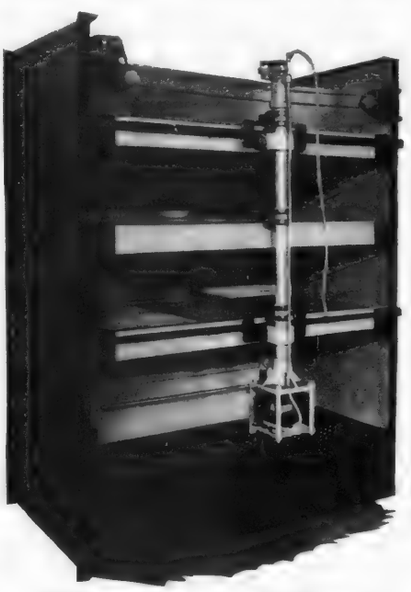
MODERN FURNACE HEATING is discussed in an interesting and comprehensive way in a catalog issued by the Hess Warming & Ventilating Co., 1207 South Western Ave., Chicago. This company first made a welded steel furnace 20 years ago, and at the present time devotes its entire facilities to this one style. A novel process is used in the fabrication of this furnace. The steel plates from which the combustion chamber is fabricated are clamped together and riveted at intervals. The edges are heated with an acetylene-oxygen blowpipe, and an electric arc is then applied at the junction of the plates, which point of contact has been preheated by the acetylene flame. The resulting arc weld is said to be exceptionally strong and uniform, as well as resistant to the expansion and contraction incident to normal use of the furnace. The material used is 12-gauge, which is about ⅛ in. in thickness. The story covering the various phases of heating is simply and well told, without exaggeration. Hess furnaces are catalogued in six sizes, ranging from 49 to 185 sq. ft. of radiating surface, in accordance with the Standard Code of the National Warm Air Heating and Ventilating Association. Pipeless furnaces also are listed in four sizes.



Three Elements of McQuay Unit Heater

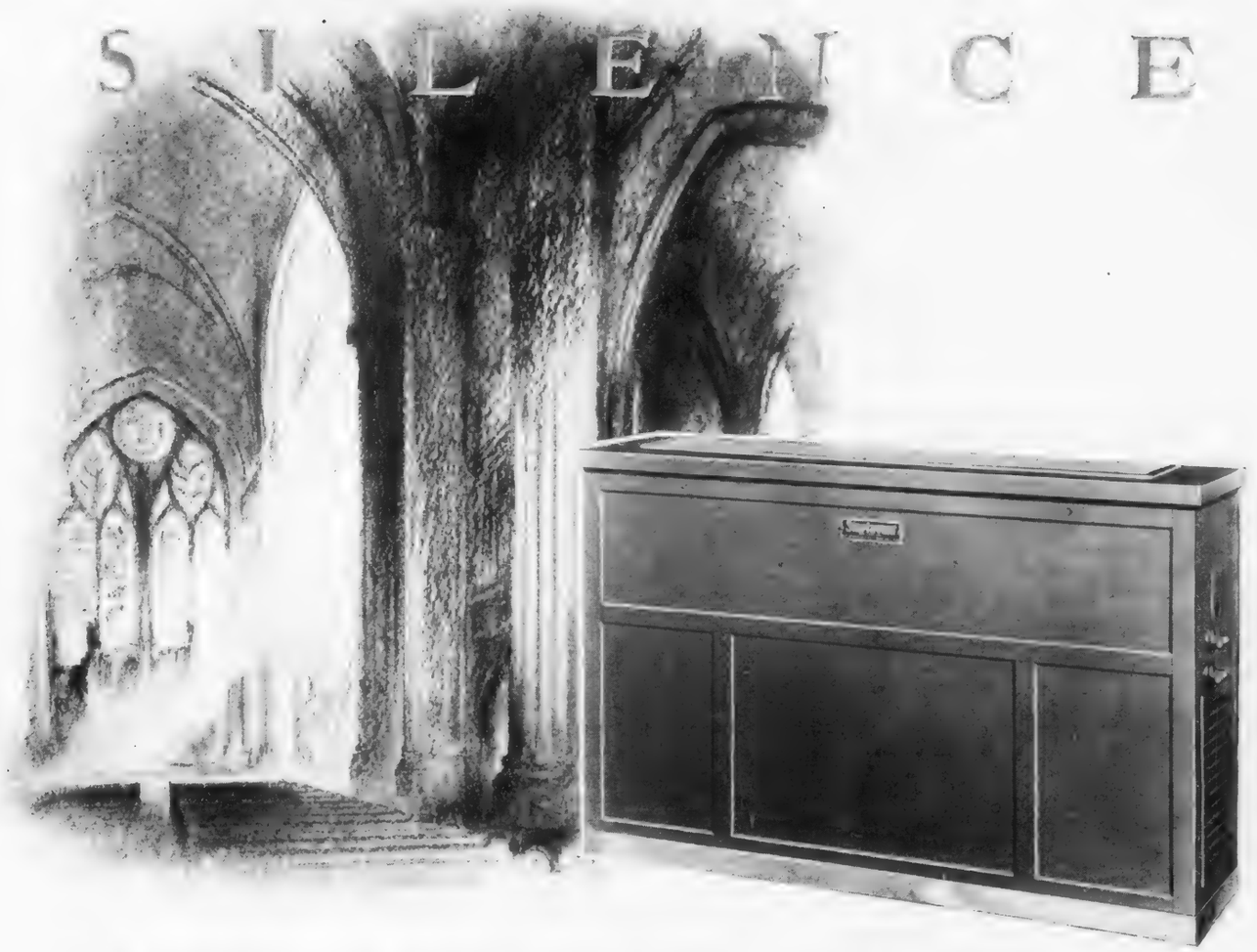
TRANE UNIT HEATERS are described in Bulletin 23 received from The Trane Co., LaCrosse, Wis. This heater is a combination of a battery of copper heaters, similar to those used in the Trane heat cabinets and concealed heaters, and a proper motor-driven, eight-blade aluminum fan. The copper tubes carrying the live steam are so spaced as to give a maximum free passage through the heater and, at the same time, keep the extended surfaces of copper at a uniform temperature throughout their entire area. The sheets are fastened to the tubes by a special process that entirely eliminates soldered or welded joints. The heaters are for either ceiling or floor mounting and can be used with any steam or vacuum system. They are, at present, made in three sizes, and a wide range of capacities is available by varying the radiating surfaces.

MIDWEST AUTOMATIC HORIZONTAL SELF-CLEANING AIR FILTER is described in a bulletin issued by Midwest Air Filters,



Midwest Automatically-Cleaned Air Filter

Inc., Bradford, Pa. In this unit, which utilizes a viscous fluid as the dirt removing medium, cleaning is accomplished automatically by flowing oil over the viscous-coated surfaces while they are in use. The motor with the slotted pipes, through which the fluid is pumped, moves horizontally along the back of the unit, and this movement can be accomplished automatically with a time switch or by hand. Unit cells, rated at 1200 cu. ft. per minute each, on continuous air flow, can be combined to produce almost any required aggregate capacity. The dirt settles out of the viscous fluid in a tank at the base of the unit, and is removed once to three times a year, depending on dust concentration of the air. The resistance of the unit is stated to be 4.25 in. with continuous air flow when the filter is operated at specified capacity.



Now — silent unit ventilation . . .
an exclusive Sturtevant attainment

STAND close to the new Sturtevant Unit Ventilator as it draws fresh, invigorating air into the room. Hold your hand near the outlet . . . you can feel the air. But, however much you strain your ears, you will not hear the fan or motor at work.

The "Silent" Sturtevant makes no sound to disturb the quiet of schoolroom, church or office.

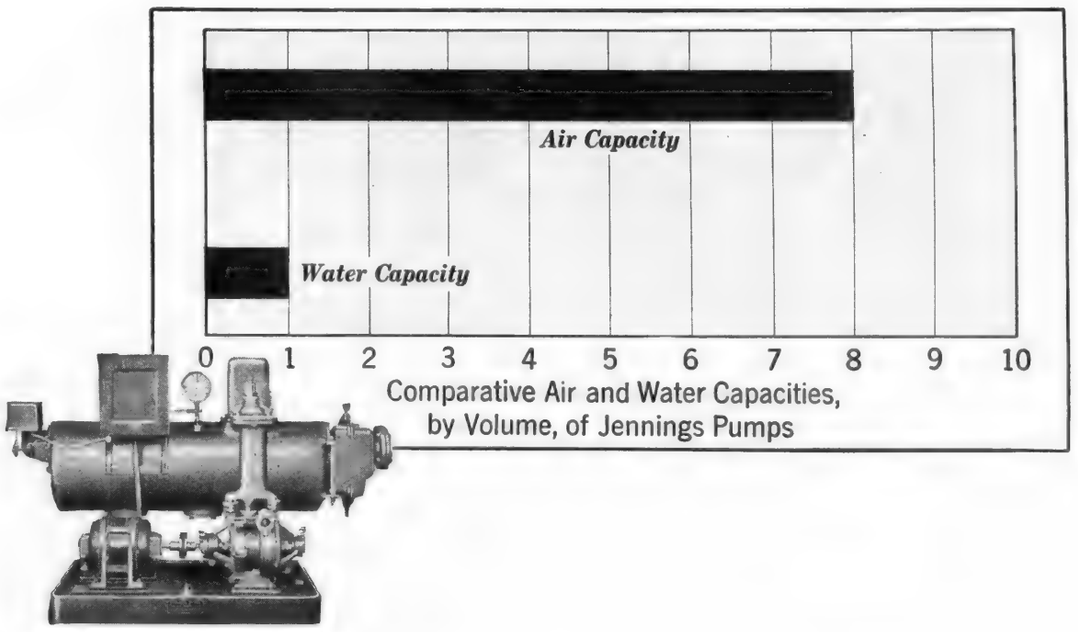
Silence is attained in the new "Silent" Sturtevant Unit Ventilator by making the fan wheels fifty per cent larger in diameter than those used in other unit ventilators of the same rating. Consequently, the fan can be run very slowly, and the air moves noiselessly at a low velocity. An added advantage gained through the use of the slow speed fan is a saving in electric power.

Insure silence in your unit ventilation by specifying the "Silent" Sturtevant. Our nearest office will gladly send you a copy of Bulletin No. 344-A which gives complete information about this exclusive Sturtevant feature.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Atlanta	Charlotte	Dallas	Indianapolis	Montreal	Rochester
Boston	Chicago	Denver	Kansas City	New York	St. Louis
Buffalo	Cincinnati	Detroit	Los Angeles	Pittsburgh	San Francisco
Camden	Cleveland	Hartford	Minneapolis	Portland	Seattle
		Toronto	Washington		

Sturtevant REG. U.S. PAT. OFF. *the Silent Unit Ventilator*



Liberal air capacity saves current

Ability to handle air rapidly primarily determines the length of time a vacuum heating pump with automatic control must operate. The larger the air capacity, the shorter the period of operation—and so the greater the saving in motor current.

This fact has been recognized in the design of the Jennings Pump. Air capacity has been made liberal. By volume it is eight times the condensate to be handled.

The result is a substantial saving in power.

NASH ENGINEERING COMPANY

81 Wilson Road **SO. NORWALK, CONN.**

Branch Sales Offices: Atlanta, Birmingham, Boston, Buffalo, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Los Angeles, Louisville, Memphis, Miami, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Tampa, Washington, D. C. **In Canada:** Montreal, Toronto and Vancouver. **European Offices:** London, Eng., Norman Eng. Co.; Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Pumps

Trade and Miscellaneous Notes

Coming Events

February 14-18, 1928. Midwestern Engineering and Power Exposition in the Coliseum, Chicago.

February 21-28, 1928. Tenth annual "Own-Your-Home" Building and Equipment Exposition in New York. Headquarters at Madison Square Garden.

March 31-April 7, 1928. Eighth annual "Own-Your-Home" Building and Equipment Exposition in Chicago. Headquarters at the Coliseum.

April 3-5, 1928. Fifth annual convention of the American Oil Burner Association in Chicago. Headquarters at the Stevens Hotel.

April 17-19, 1928. Annual convention of the National Warm-Air Heating and Ventilating Association in Chicago. Headquarters at the Stevens Hotel.

May 7-10, 1928. Thirty-second annual meeting of the National Fire Protection Association in Atlantic City, N. J. Headquarters at the Hotel Chalfonte-Haddon Hall.

June 4-7, 1928. Thirty-ninth annual convention of the Heating and Piping Contractors National Association in Philadelphia, Pa. Headquarters at the Bellevue-Stratford Hotel.

June 12-15, 1928. Annual convention of the National District Heating Association at Atlantic City, N. J. Headquarters at Ambassador Hotel.

June 26-29, 1928. Semi-annual meeting of the American Society of Heating and Ventilating Engineers at West Baden, Ind. Headquarters at West Baden Springs Hotel.

Miscellaneous Notes

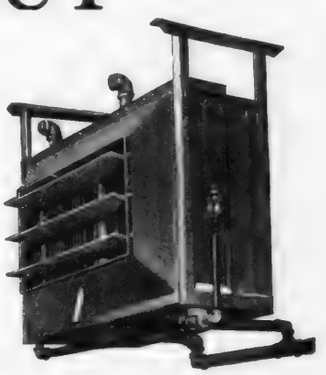
December building operations and those for the year 1927, have been reported by the F. W. Dodge Corporation. In December there was a gain of 3% over the total for November and a drop of 11% from the total for December, 1926. The figures for 37 States, east of the Rocky Mountains were $477,363,800. Analysis of the December building record showed that 43% of all construction was for residential buildings, 19% for public works and utilities, 18% for commercial buildings, 6% for industrial projects and 5% for educational projects. In New York State and Northern New Jersey, contracts amounted to $128,890,000. This figure was almost the same as the amount reported for November but was 43% under the record for December, 1926. In the New England States, the contracts amount to $30,862,600, showing a loss of 27% from the total reported for November, and only 7% less than December, 1926. There was a drop of 2% below the December, 1926, record for the Middle Atlantic States. In the Pittsburgh district the figures show a 5% decrease from the amount reported in December, 1926. Figures for the Central West show that this was the highest December contract total on record for this territory, being 35% more than that reported for November, 1927, as well as 29% over the total for December, 1926. A 39% decrease from the preceding month, and 12% decrease from December, 1926, has been reported in the Northwest. In the Southeastern States there was reported an increase of 26% over the total for December, 1926, but a decrease of 8% from the total for November, 1927. Texas reports a decrease of 42% from the amount for November and 24% less than the total for December, 1926.

It also was reported that the 1927 construction volume was the second highest in the history of the country. Contracts let on new building and engineering work during the year, in the

"WHY SHOULD I BUY AUTOVENT UNIT HEATERS?"

THIS WAS A FAIR QUESTION—

HERE'S THE ANSWER!



AUTOVENT UNIT HEATERS save on the original installation cost because:

(1) Fewer units are needed for equivalent heat radiation; the job is installed quicker, thus saving on labor time.

(2) Fewer traps or valves needed; another important saving in cost.

(3) Less piping, fewer fittings; labor cost further reduced by shortening time required to complete installation.

(4) Overhead installation further reduces cost where floor-space is at a premium.

AUTOVENT UNIT HEATERS save on the day-by-day operating cost because:

(1) No hot, over-night fires necessary.

(2) Greater flexibility of control gives more rapid heat spread for same amount of steam used.

(3) Each unit individually controlled and can be shut down when not needed; a vital saving.

(4) Cost of maintenance is less because of fewer units to look after.

Plant Owners are now realizing that UNIT HEATERS *heat quicker*—heat better—and *cost less* to buy and operate!

AUTOVENT FAN & BLOWER CO.,

1805-27 N. Kostner Ave., Chicago, Ill.

37 States east of the Rocky Mountains, reached a total of $6,303,055,100, which was a drop of only 1% from the record total of 1926, and an increase of 5% over the total for the year 1925.

Thomas J. Fitzsimmons, connected with the Kitts Steam Specialty Co., 56 East Second St., Oswego, N. Y., has purchased the interests of R. H. Hobbie in the company. The business will be carried on as the Kitts Steam Specialty Company but with a new company made up of the following officers: President, Thomas J. Fitzsimmons; vice-president, M. A. Skelley; secretary and treasurer, I. C. Fitzsimmons. It is expected that a new plant will be built on property recently acquired so as to enlarge facilities for the manufacture of the company's steam traps, valves, damper regulators and steam specialities.

Thatcher Co., Newark, N. J., manufacturer of boilers, ranges, and furnaces, has provided its employees with more than $625,000 worth of group life insurance, it has been announced by the Metropolitan Life Insurance Co., New York. Approximately $500,000 worth of accidental death and dismemberment insurance, combined with health and non-occupational accident benefits, supplements the life insurance protection.

E. R. Gauley, formerly with the Imperial Radiator Co., Ltd., Toronto, has resigned to become associated with the trade publication, *Sanitary Age.* This publication recently formed a division under the heading of "Heating Age" of which Mr. Gauley will take charge.

M. Barry Watson has resigned as director of the department of engineering training at the Central Technical School, Toronto, to enter consulting practice with Harry H. Angus, engineer of Toronto. Mr. Watson is a graduate of the University of Toronto with the degrees of B.A., Sc. in electrical, C.E. in civil, and M.E. in mechanical engineering.

Allen Magee Scaife, of Oakmont, Pa., whose marriage to Miss Sarah Cordelia Mellon, of Pittsburgh, a niece of Secretary of the Treasury, Andrew Mellon, was one of the most important social events of the year in Pittsburgh, is a member of the firm of Wm. B. Scaife & Sons Company, the well-known manufacturer of tanks and other products used by the heating and plumbing trades.

H. B. Addington, formerly of Cleveland, O., has resigned his position as chief engineer of the heating division of the Modine Mfg. Co., Racine, Wis., and has returned to Cleveland.

Change of Address

The Cooling and Air Conditioning Corp., 11 West 42nd Street, New York, announces that it has taken new quarters at this address.

Contracts Awarded

Hughes Heating Co., Memphis, Tenn., heating Pharmacy and Library Building for the University of Tennessee in Memphis for $25,860.

Cullyford Plumbing and Heating Co., Amarillo, Tex., heating and plumbing for the erection of the $1,000,000 Medical Arts Building.

Paul J. Hamjy, Utica, N. Y., heating and ventilating new high school at Hamilton for $26,000; also heating and ventilating two new grade schools in Oswego for $80,000.

MacMahon Plumbing Co., Kansas City, Mo., heating and plumbing for the new $650,000 Dan Hunt Building at Tulsa, Okla.

Central Station Heating Notes

Jonesboro, Ark.—Following a tour of inspection of six State educational institutions made by President Kays of the A. & M. College, it is announced that funds will be sought from the legislature for completing the present heating plant at the college and extending it so that all of the present and contemplated buildings may be heated from the same source.

MANUFACTURED WEATHER

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

makes

"Every day a *good* day"

Air Conditioning

Humidification, Dehumidification
Centrifugal Refrigeration
Cooling of Public and Industrial Buildings
Temperature and Humidity Control

DRYING AND PROCESSING

Carrier Engineering Corporation

Offices and Laboratories
NEWARK, NEW JERSEY

SALES OFFICES
New York Philadelphia
Boston Chicago
Cleveland
Los Angeles
Kansas City
Washington

See our detailed data in A. S. H. & V. E. Guide.

Literature on request. Write concerning your specific problem.

KAUFFMAN

AIR DIFFUSERS

SINCE 1908

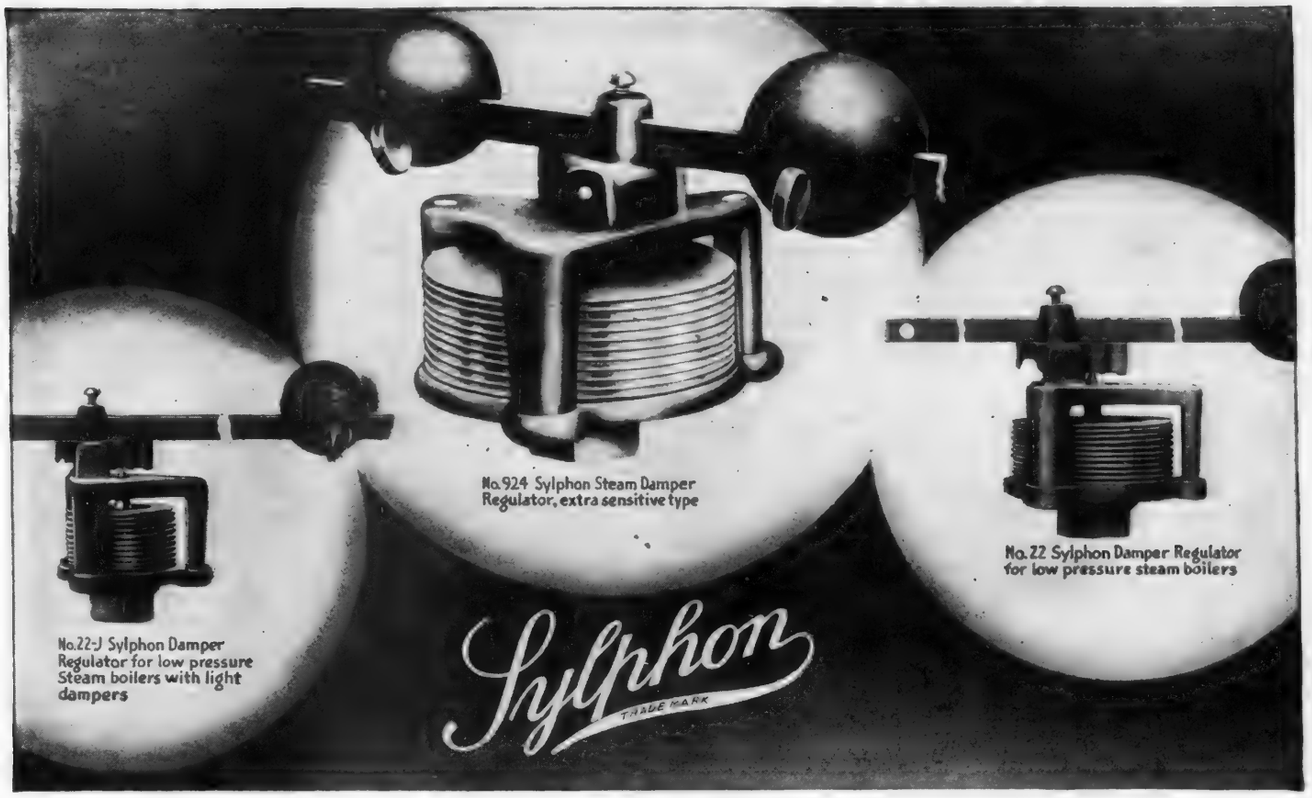
Kauffman Air Diffusers

HAVE BEEN IN USE IN

Some of America's Finest Theatres

Simple to Install—Low in Price
Graduated Air Control

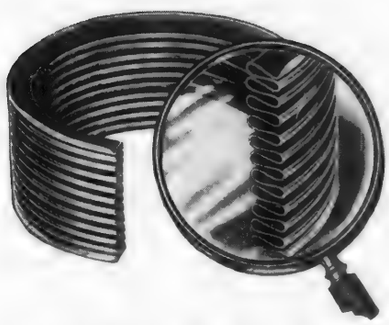
AMERICAN METAL PRODUCTS CORP.
ST. LOUIS, U. S. A.


No. 924 Sylphon Steam Damper Regulator, extra sensitive type
No. 22 Sylphon Damper Regulator for low pressure steam boilers
No. 22-J Sylphon Damper Regulator for low pressure Steam boilers with light dampers
Sylphon
TRADE MARK

Helping the Steam Heating Plant Automatically Deliver the Goods!

Sylphon automatic regulation of draft dampers makes any boiler do a better job—saves fuel, saves firing, and prevents over or under-heating.

A Sylphon Steam Damper Regulator eliminates the need for continual trips to the cellar to adjust draft dampers. These sturdy, self-contained damper regulators, through years of dependable performance on leading boilers, have proven to be a guarantee of heating satisfaction.



Cross section of cut-open Bellows showing formation of folds or corrugations to equalize the strain of expansion and compression, giving the durability for which the Sylphon Bellows is so justly well known.

It's The Sylphon Bellows That Makes Them Dependable

The exclusive feature of Sylphon Steam Damper Regulators is the well-known Sylphon Bellows, used as the diaphragm in every genuine Sylphon Damper Regulator. This diaphragm with its everlasting sensitiveness and positive action governs the opening and closing of draft dampers in smooth, continuous and proportionate response to slight changes in steam pressures.

You can give your client no better guarantee of complete heating satisfaction than that offered by the Fulton Sylphon Steam Damper Regulator.

Refuse imitations—Insist upon the genuine

Send for Bulletin WDR-8 containing detailed information.

The Fulton Sylphon Company

Originators and Patentees of the Sylphon Bellows

Knoxville, Tennessee, U.S.A.

SALES OFFICES IN: New York Chicago, Detroit, Boston, Philadelphia, and in all the principal cities of U. S.

European Representatives: Crosby Valve and Engineering Co., Ltd., 41-42 Foley Street, London, W. 1, England.

Canadian Representatives: Darling Bros., Ltd., 120 Prince Street, Montreal, Canada.

Sylphon Steam Damper Regulators

Manufacturers' Notes

Lincoln Electric Co., Cleveland, O., announces that John Van Horne has been transferred from Atlanta to Moline, Ill., and will be located at 514½ Fifteenth Street. Mr. Van Horne will operate under the direction of R. D. Malm, western manager at Chicago, and will cover the tri-cities for the sale of Linc-Weld motors and Stable-Arc welders.

Cutler-Hammer Mfg. Co., Milwaukee, Wis., has appointed Fred H. Oberschmidt as manager of the new Pacific Coast district.

American Radiator Co., New York, announces the opening of a showroom at 301 Main St., Paterson, N. J.

Dalquist Mfg. Co., Boston, Mass., manufacturer of copper boilers has completed a large addition to its plant which will add 36,000 sq. ft. of floor space to its present facilities. New equipment has been installed and offices have been arranged for in part of the new section.

Laco Gas Burner Co., Griswold, Iowa, manufacturer of the Laco oil burner, is building a new factory of modern design with 21,600 sq. ft. of floor space. L. A. Cocklin, president and general manager of the company, states that the new plant will be prepared to produce up to 25,000 burners annually.

Jenkins Bros., 80 White St., New York, announce the appointment of James R. White, formerly vice-president of Rickard & Company, New York, as secretary to succeed William B. Rufe, deceased. Mr. White was presented with a gold watch as a token of esteem by the directors of his previous connection at a dinner in his honor.

Trane Co., La Crosse, Wis., announces that a new testing laboratory is being added to its plant. The new two-story building is of brick and tile construction and will be heated by Trane unit heaters, a new development of the company, and will be devoted almost entirely to testing and experimental laboratories.

United States Ozone Co., 500 North Dearborn St., Chicago, announces that it has no connection whatsoever with the recently-incorporated United States Ozone Company of America, Scottdale, Pa. The first-mentioned company had its equipment manufactured by the Electric Water Sterilizer and Ozone Co., of Scottdale, before this company became bankrupt. Since that time, more than a year ago, the United States Ozone Company has engaged in the manufacture of its own equipment, having organized a staff of its own engineers and technologists. Two branch offices of this company are located in Montreal and San Francisco, operated by Darling Brothers, Ltd., and Montgomery Brothers, respectively.

Universal Humidifying Co., 2013 Sansom St., Philadelphia, Pa., announces that the name of the company has been changed to the Universal Humidifier Corporation, and has moved its headquarters from this address to the Denckla Building. The management of the office will continue to be in charge of William G. Braemer. The company also announces the opening of a sales office at 39 Cortlandt St., New York, with Van Richards in charge as sales manager.

Mueller Co., Decatur, Ill., announces the appointment of Charles J. G. Haas as manager of the New York division of the company to take charge of the offices and warehouse at 135th & Walnut Streets. Mr. Haas has been identified with the company for the past 15 years, the last ten of which have been spent in charge of the New England territory.

Janette Mfg. Co., 556 West Monroe St., Chicago, has acquired control of the Monroe Machine Tool Company and will manufacture and sell Monroe oil pumps. The entire personnel of the Monroe company will be moved to the Janette plant. All correspondence should be addressed to the Janette Mfg. Company.

Bell & Gossett Co., 3000 Wallace St., Chicago, Ill., has appointed R. E. Moore as manager of its B & G heater department.

WANTED
Engineer Sales-Manager

An established manufacturer of heating and ventilating equipment seeks an engineer sales-manager. The candidate should be thirty-five to forty-five years of age, a graduate mechanical engineer trained and long experienced in heating and ventilating engineering, an able executive capable of forging an efficient selling organization and building sales volume. The salary is commensurate with the candidate's history and qualifications. In addition to salary an opportunity to become financially interested is offered. In making application, please write fully enough about your qualifications to enable us to form a fair judgment before interview. All correspondence will be held strictly confidential. Address Box 150, c/o Heating and Ventilating Magazine.

E Z
RADIATOR HANGER

Please the women! Recommend the slim, tube-type **legless** radiators, hung at the right height, and easy to clean beneath. E-Z Hangers fit every make of radiation **including all tube-types.**

Healy-Ruff Co.
772 Hampden Ave.
St. Paul, Minn.

[redacted]

Jim (who is something of a pessimist): "Now that we've got the plagued system hooked up, I wonder how many sand holes we'll find when we test it out."

Old Timer: "We're in luck, Jim. They sent us Grinnell stuff this time. Didn't you see the big 'G' on the fittings? Sand holes seem as scarce as cow-feathers in those castings."

The Old Timer Knows

One of the big economies of Grinnell Fittings is the way they cut down installation costs. Many a time, when the water, steam, or air is turned on, not a single section of pipe has to be backed out to put on a new fitting. Their freedom from sand holes is extraordinary. See for yourself—by using Grinnell Fittings on your next job. If your jobber hasn't them in stock write for the name of the nearest distributor. Address Grinnell Company, Inc., 208 West Exchange St., Providence, R. I.

GRINNELL
PIPE FITTINGS

Cast Iron Fittings—Adjustable Pipe Hangers

GRINNELL

Pipe Bends—Welded Headers—Lap Joints—Piping Supplies

Stockham Pipe and Fittings Co., Birmingham, Ala., announces the following changes in its executive personnel: Douglas W. Stockham will be vice-president in charge of sales to succeed George B. Baldwin, who has resigned; Roy L. Stewart, for the past five years Pacific Coast representative, has been transferred to the home office and will be manager of sales; Harry N. Hall of Philadelphia has been appointed advertising and sales promotion manager of the company, and Germer Petesch, formerly manager of the Boston warehouse, has been transferred to the Chicago warehouse as manager. H. G. Farnham replaces Mr. Petesch in Boston, and Irving Lyon, steel sales engineer, formerly manager of the Crandall Packing Co., Birmingham, has been appointed manager of the steel sales promotion department of the company with headquarters at the Birmingham office.

George B. Baldwin & Co., has been organized in Chicago to engage in the general heating and plumbing supply jobbing business. Mr. Baldwin was formerly vice-president in charge of sales of the Stockham Pipe and Fittings Co., Birmingham, Ala.

Petroleum Heat and Power Co., 511 Fifth Ave., New York, distributor of 15° fuel oil in New York, Stamford, Providence, Boston and adjacent cities, has gone into the distribution of the lighter 28° fuel oil for domestic consumption.

Preferred Oil Burners, Inc., Peoria, Ill., has appointed William G. Miller & Co., Inc., 10209 Woodward Ave., Detroit, formerly handling this oil burner as a dealer, as distributor in Wayne, Macomb and Oakland counties surrounding Detroit. Mr. Miller, head of the company, is president of the Detroit Association of Sanitary and Heating Contractors.

Super Oil Heator Co., 275 Connecticut Blvd., East Hartford, Conn., soon will move its manufacturing plant to Pawtucket, R. I., to occupy a part of the plant of the Potter & Johnston Machine Company. The company was organized in 1923 by David B. Roberts to manufacture compact oil-heating apparatus, and recently officials of the Potter & Johnston Company bought a large amount of stock in the Super Oil Heator Company. Officers of the company are: President, David B. Roberts; vice-president, John Johnston; treasurer, W. Wallace Potter, and secretary, Earl H. Roberts. W. Wallace Potter is president of the Potter & Johnston Machine Company and John Johnston is secretary.

Duplex Oil-Gas Burner Corp., 228 North La Salle St., Chicago, Ill., announces the appointment of R. E. Norris as general sales manager for the company. Mr. Norris was formerly general sales manager for the Pearson Oil Burner Company, and previously was president and general manager for the Chicago No Kol Company.

Hutchison Regulator Sales Corp., 12 Lispenard St., New York, has appointed L. E. Pelletier as representative of the company in the eastern territory for the sale of vapor and steam heating appliances. Mr. Pelletier was formerly with the Putnam Company, Putnam, Conn., manufacturer of low-pressure cast-iron boilers.

Merger

J. L. Mott Co., of New York and Trenton, N. J., the Laib Company and the Columbia Sanitary Mfg. Co., of Louisville, Ky., have merged.

The consolidated group, which also includes seven subsidiary companies, will be known as the J. L. Mott Company, Inc. With the extensive Mott plant in Trenton and the Columbia works at Louisville, each of which has an area of about 25 acres, the manufacturing and distributing facilities of the new $10,000,000 company will constitute one of the largest units in the industry.

George H. Laib, president of the Laib Company, will head the new concern and with him will be associated as general manager W. G. Probst, vice-president of the Columbia Company, and Jordan L. Mott, 3rd, fifth generation of the Mott family.

STUDIO APARTMENTS
138 West 58th Street, New York City
Sugarman & Berger, Architects

All the 150 bathrooms in the Art Studio Apartment Building efficiently ventilated by only two 24" and two 18" DeBothezat Disc Pressure Fans connected to a duct system.

"Our fans will not do the work, you will have to install blowers"

was the statement of a prominent fan manufacturer. But the DeBothezat Company was called in and have conclusively proven that DeBothezat Disc Pressure Fans could take care of the job economically and with low installation costs. At the same time the initial low cost of DeBothezat Pressure Fans is an advantage every engineer and contractor will appreciate.

Three saving factors prevailing when installing DeBothezat Pressure Fans:

1. Initial cost. 2. Installation cost.
3. Operating cost.

Write for Catalogue H. V.

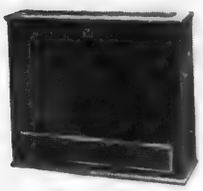
De Bothezat Impeller Co., Inc.
1922 Park Ave., New York City

A Heating Unit FOR Every Purpose

All Venturafin heating units have more than five times the efficiency of ordinary radiators, wall coils, etc. They can be used with either steam or hot water and force heated air where you want it, and as much as you want—eliminating hot spots, cold working areas, and affording better ventilation, more even distribution of heat and more perfect heat control.

Venturafin No. 4. Furnished with or without a recirculating box. It delivers 2000 cubic feet of heated air per minute, weighs 350 lbs. and is equivalent to 500 square feet of direct radiation—radiators, wall coils, etc. This unit is particularly adaptable for industrial applications—garages, warehouses, factories, shops and industrial plants of every type and description.

Venturafin No. 2. A compact, highly efficient heating unit for stores, offices, small factories, shops, churches, lodge halls, garages and scores of other installations where high efficiency, compactness and pleasing appearance are essential. This unit delivers 450 to 900 cubic feet of heated air per minute, weighs less than 80 lbs., is materially smaller in size than an ordinary radiator and is the equivalent of from 125 to 200 square feet of ordinary radiation.



The Universal Heating and Ventilating Unit, finished in first quality furniture stock steel, for schools, public and office buildings, has practically the same characteristics as the Venturafin units except that heated air is forced into circulation by a multiblade fan, instead of a disc fan.

Venturafin No. 7. This is the largest Venturafin unit built. It has a capacity of 8000 cubic feet of heated air per minute, weighs 1100 lbs. and takes the place of 2000 square feet of radiators, wall coils, etc. This unit is highly desirable for heating large areas in factories, warehouses, amphitheatres, and smaller structures where heating with ordinary methods is impractical, and ofttimes impossible.

Heat with Unit Heaters

For complete information on heating or electric ventilating equipment get in touch with the nearest American Blower office, or write direct to the factory.

AMERICAN BLOWER CORPORATION, DETROIT
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.
BRANCH OFFICES IN ALL PRINCIPAL CITIES

American Blower

(703)

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

WANTED—Heating and sales engineer to represent boiler and radiator manufacturer in New York City. Give full particulars, experience, etc. Address Box 21, care of Heating and Ventilating Magazine.

REPRESENTATIVES WANTED—Manufacturer of complete line of fans, air washers and heaters of all designs, desires first class representatives in Cleveland, Pittsburgh and Buffalo. Address Box 22, care of Heating and Ventilating Magazine.

SALES ENGINEER—Opening office, southwestern Ohio, exclusive of Hamilton County, wants several high grade lines, including boilers, radiators, heating specialties, ventilating equipment, pumps, etc. Has following with trade and architects. What have you to offer? Address Box 23, care of Heating and Ventilating Magazine.

POSITION WANTED—Boiler and radiator salesman who has produced desires to represent a manufacturer in the state of Michigan on a commission basis, or as a manufacturer's agent. Will consider anything in the heating line. Address Box 24, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representatives on commission basis. Address Box 25, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of cabinet radiation, cores and unit heaters, desires recognized representatives on commission basis. Address Box 29, care of Heating and Ventilating Magazine.

SALES ENGINEERS WANTED—Old established company, manufacturing high-grade vapor heating specialties, has some territories open at the present time. Write if you are interested in selling this line on a commission basis. State territory and other lines. All communications held strictly confidential. Address Box 26, care of Heating and Ventilating Magazine.

DESIGNING ENGINEER WANTED

We are the largest manufacturers of our line of Equipment and Machinery.

We need a man with thorough technical training and also practical experience in designing and developing air, handling Equipment, to design, develop and test Dust Collectors and low pressure air, material handling systems.

This position offers splendid opportunity for a man of dependability, initiative and resource to make a permanent connection with a high grade corporation.

In your first letter give us full particulars concerning personal matters, education, technical training and salary expected. Also a resume of your working experience, advising names of your last three employers, scope of your duties with each, and reasons for leaving. Your letter will be treated as confidential.

Interview will promptly be arranged if your qualifications fill our requirements. Address Box 28, care of Heating and Ventilating Magazine.

WANTED—Mechanical engineer with thorough theoretical training, especially in the physics of heat and pneumatics. Must have had several years' design, drafting room and practical shop experience. Must be capable of inaugurating and conducting mechanical research and development along the lines of heat control, air distribution and humidifying apparatus. Work is connected with research department of large middle western manufacturing company. Address Box 27, care of Heating and Ventilating Magazine.

SUPPLY YOUR LIFE'S LUXURIES WITH TECHNICAL TRAINING!

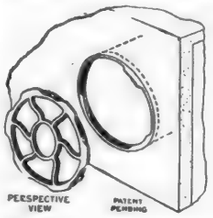
Let the ST. LOUIS TECHNICAL INSTITUTE help in solving your trade problems. Find your pay streak—have steady employment—deserve higher positions—have pride and personality in your work. For 18 years we have specially trained quite an army of men. Our Courses are admirably suited to qualify you in an Engineering way. Select your course, full information is free—no obligation because our School is one of Service.

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute.
Est. 1910
The most thorough institution for Technical Home Study to-day.
4543 Clayton Avenue. St. Louis, Mo.

for gallery risers USE Round shaped Vents

Write for convincing proof that DISC-LOC, the round shaped vent, is cheaper and easier to install than oblong step grills. Also more practical from the standpoint of structural strength.

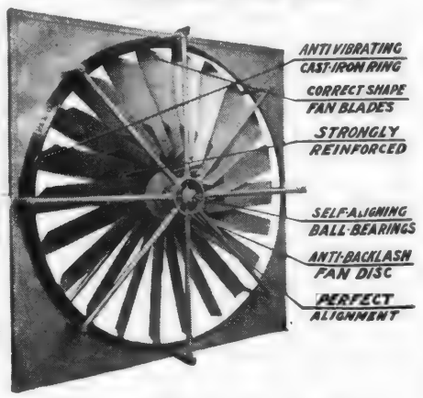


Used by the Newest Theatres in many cities. Architects favor DISC-LOC vents whenever they have been tried. Made with or without dampers.

KNOWLES MUSHROOM VENTILATOR CO.
202 Franklin St., NEW YORK

TYPHOON

Multiblade Disc Blower



Disc Blowers
Centrifugal Blowers
Belt-driven Direct-connected
Unit Drive Fans
Unit Heaters
Ventilating Systems
Air Conditioning Systems

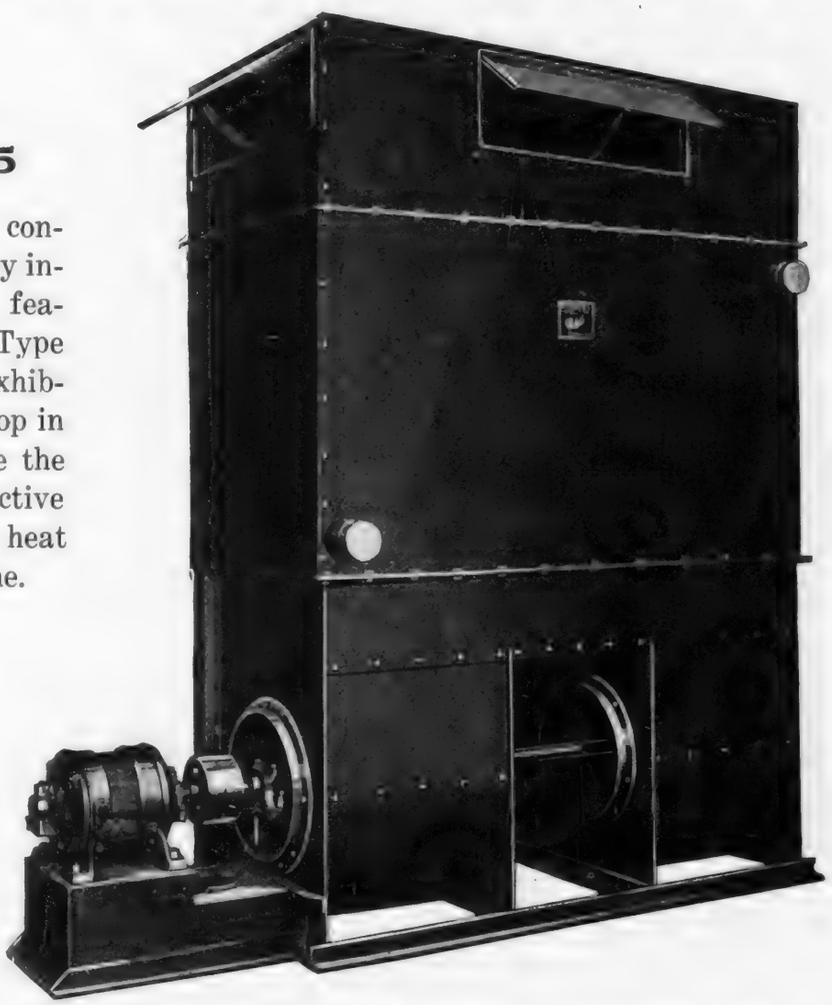
Typhoon Products and Typhoon Systems have been installed all over the country and all over the world. Typhoon is an international standard of efficiency for cooling, heating, and ventilating systems.

TYPHOON FAN COMPANY
345 West 39th Street
New York City
Dealers' and engineers' inquiries invited

See this equipment at the Power Show

BOOTHS
123 — 124 — 125

Higher efficiency, simpler construction, lower cost and easy installation are four of the features of the new Buffalo Type "AA" Unit Heaters to be exhibited at the Power Show. Stop in at booths 123-125 and note the quiet operation and the effective method of distributing the heat throughout the working zone.



Lower Cost Per B.T. U.

The all-steel heating coil assembly tested under hydraulic pressure enables the Type "AA" to use high pressure steam. This reduces the cost per heat unit and also enables each heater to serve a larger area.

Let our Engineering Department work with you on your heating problem. Branch engineering offices in principal cities.

Buffalo Forge Company

480 Broadway Buffalo, N. Y.

In Canada
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

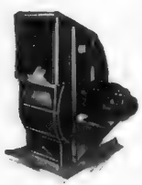
"Buffalo" **Type "AA" Unit Heaters**

for high pressures

1878 — AIR ENGINEERS FOR FIFTY YEARS — 1928

It shaped the trend toward high velocity unit heaters

The Johnson propeller type Unit Heater



Johnson volume blowers are made in a wide range of types and sizes

The all-round, year-round Johnson Propeller Fan

The growing popularity of the high velocity or blower type unit heater is a sweeping confirmation of a principle that was introduced and pioneered by the Johnson Fan & Blower Company. High velocity has meant higher efficiency, better heat distribution, greater saving in installation cost.

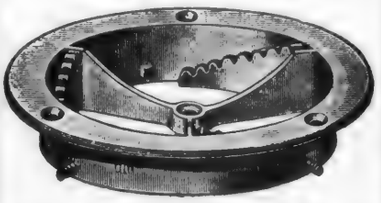
There can be no more striking evidence that the Johnson line offers the unit heater at its best than this rapid acceptance of Johnson principles by the entire heating industry. You play safe when you standardize on Johnson. There is a Johnson Unit Heater for every requirement—but just one rigidly maintained Johnson quality. Every Johnson installation offers an excellent profit followed by a still greater profit—the profit that goes with lasting satisfaction.

Let us show you why you should concentrate on the Johnson line

The Johnson Fan & Blower Co.
1325 West Lake Street
Chicago

JOHNSON
the pioneer high velocity Unit Heater

View of Bottom Casting



Nu-Notch
REG. U.S. PAT. OFF.

THE
Mushroom Ventilator You Can Depend Upon
FOR ANY KIND OF FLOOR

"Nu-Notch" can be installed complete just before the seats are placed, thus doing away with breakage. Attached to

Wood Floors by 3 lag screws in flange countersunk holes.

Concrete Floors by 3 L lugs bolted to floor flange.

Monolithic or similar type of floors, by 3 set screws securing the collar to the sleeve.

"Nu-Notch" is specified by leading architects and engineers. Send for details.

Knowles Mushroom Ventilator Co.
202 Franklin Street NEW YORK CITY

MOTORS
SPECIAL OR STOCK DESIGNS
For Heating and Ventilating Equipment

1/30 to 2 h.p.

for all commercial currents.

Fully enclosed. Specially protected against moisture, dust, dirt and fumes. Free from vibration and consequent noise. Temperature rise not to exceed 40° Centigrade. Physically interchangeable. Used on many of America's leading motorized devices. In daily service on numerous types of heating and ventilating equipment.

THE EMERSON ELECTRIC MFG. CO.
2018 Washington Blvd., St. Louis, Mo.
806 W. Washington Blvd., Chicago.
50 Church St., New York City
BUILT TO LAST
EMERSON
MOTORS
and **FANS**

Can you think of a harder place to heat?

Hangar at the Lakehurst, (N. J.) Naval Air Station, the largest single enclosed space in the world—962 feet long, 348 feet wide, 200 feet high—57,120,000 cubic feet

THERE is room in this great hangar to house two giant airships the size of the Los Angeles, and still have room for several smaller ships. Think of the volume of air in such a building! Yet the task of providing an effective heating system for this mammoth enclosure did not prove difficult for Skinner Engineers.

Ever since Henry Baetz, now Chief Engineer, originated the unit method of industrial heating, over a third of a century ago, Skinner Engineers have been adapting that method successfully to all types of buildings. The design of the heating system for this famous hangar was just one of the thousands of experiences that have prepared Skinner Engineers better than anyone else to give you

True "Work-Area" Heating at Less Cost for Installation and Operation

"Work-Area" Heating is simply heat delivered where your producers are working, not wasted up at the roof. True "work-area" heating is achieved by the use of the Skinner (Baetz Patent) Air Heater. A special multivane fan, housed in the Air Heater, spreads a blanket of warmed air over the room. At the same time, air from the floor level is drawn into the heater and passed thru nested steam coils. As the air drawn from the floor level must be replaced, the heated layer is pulled right down into the "work-area". This gives

Perfect Uniformity of warmth over the entire room

—every worker is comfortable, production is high.

Isn't it easy to see the saving made possible by this combination? The heating knowledge of Skinner Engineers assures you of a *saving on installation costs.* The effectiveness of the Skinner Air Heater *saves you money on fuel.*

See phone book for branches in:

Cleveland	**Washington**
Buffalo	**Kansas City**
Detroit	**Pittsburgh**
Seattle	**Baltimore**
Chicago	**Philadelphia**
Boston	**Indianapolis**

Factories at St. Louis and Elizabeth, N. J.

MAIL COUPON TODAY

Skinner Bros. Mfg. Co., Inc.,
1450-90 S. Vandeventer
St. Louis, Mo.

I am interested in:

- ☐ Heaters
- ☐ Ventilators
- ☐ Dryers
- ☐ Dust Collectors
- ☐ Light Weight Heaters
- ☐ Direct Fired Heaters

Name _____

Address _____

H4

Skinner Brothers *Engineered* Heating

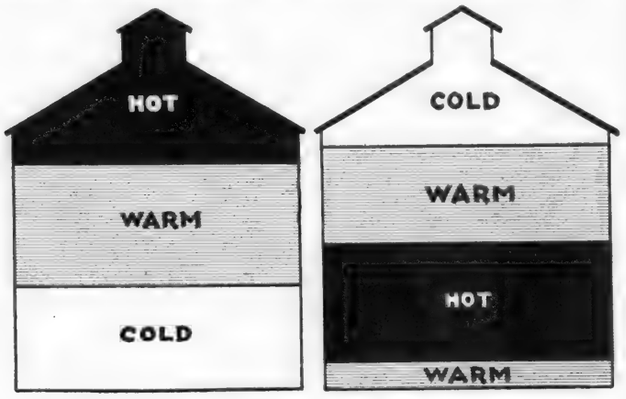
1450-90 S. Vandeventer, St. Louis, Mo. **New York Office: 1710 Flatiron Bldg.**

Originators of the Unit Method of "Work-Area" Heating

Science has found

A New Way to Heat Your Factory

No longer will the ceiling be stifling hot while the floor is icy cold! Science has discovered a way to keep the heat down where the workers work. Pecco Unit Heaters will do this for your plant as they have for hundreds of others!



THE OLD WAY THE NEW WAY

Pecco Heaters force the heated air horizontally across your factory floor at just the proper height to keep the inmates warm—instead of permitting it to waste its warmth far above the workers' heads.

Install Pecco Unit Heaters and watch your fuel bills shrink! Can be installed in your present building without material change in your heating plant. Write for a descriptive booklet which tells the complete story.

PECCO, *Incorporated*

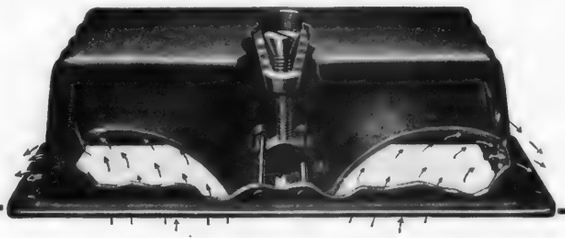
2980 North Market Street, St. Louis

Please send me a copy of booklet "Pecco Unit Heaters."

Name .....

Address .....

.....



Enflo Diffuser

Permits Greater Velocity of Air Without Drafts

It is not the amount of air admitted by a diffuser that counts for its efficiency as much as the manner in which the air is delivered. This important factor is the outstanding feature of the Enflo Air Diffuser. With the Enflo a greater velocity of air may be maintained without annoyance to those in the immediate vicinity.

The amount of air delivered may be regulated by one screw located in the center of the top, and there are no parts connected with the Enflo that may become loose or rattle. It is made completely of cast iron, which will withstand unusual wear and abuse. And another feature is the minimum amount of labor necessary to install the Enflo Air Diffuser.

Write for illustrated catalog

VENTILATING PRODUCTS CO.

2800 Cottage Grove Ave., Chicago, Ill.

CONTROL THE SPEED

OF YOUR VENTILATING EQUIPMENT!

REGULATE WARM AND COLD AIR VOLUME

WITH THE TIME TESTED

HORTON

VARIABLE SPEED

PULLEY

HORTON MANUFACTURING COMPANY

3008-3016 University Avenue S.E. Minneapolis, Minn.

MINNEAPOLIS REFERENCES

Morgan-Gerrish Co. Richardson-Boynton Co. Vroman Cook Co.

American Foundry & Furnace Co., St. Paul

JAMES M. SEYMOUR

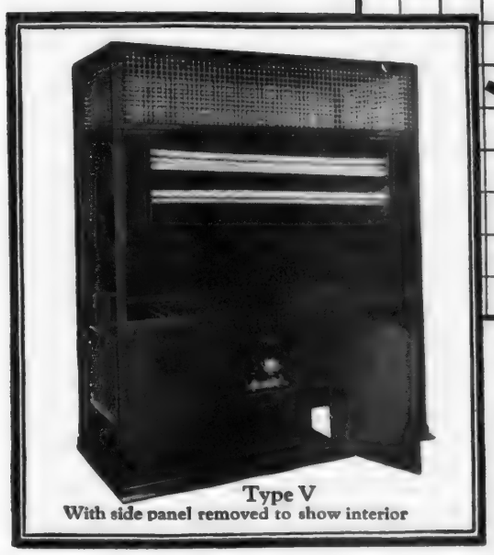
Established 1888

Lawrence St., Mechanic St. and Kirk Place, NEWARK, NEW JERSEY

AUDITORIUM FANS, 36" to 120" to fit any square opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection TWIN FANS include shafting and center bearing.

Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

SEND for BULLETINS, PRICES, and DISCOUNTS

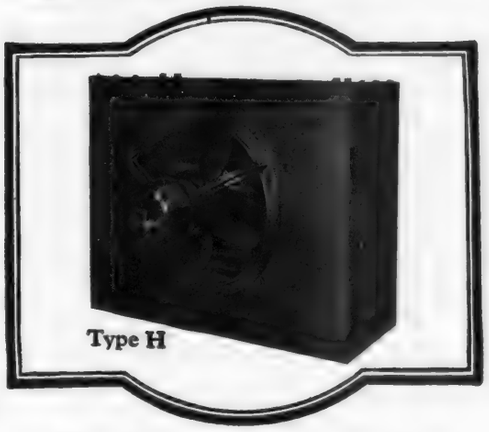


Type V
With side panel removed to show interior

The Peak of EFFICIENCY

is obtained with Massachusetts Unit Heaters

The Arcoblast heating element composed of staggered rows of metallicly attached fin-wound copper tubes expanded into two castiron tube sheets which, with the tapered design cast-iron header bodies flange-connected to the tube sheets, form the supply and return headers.



Type H

Where floor space is not available we recommend the Ceiling Type H Unit Heater, built in three sizes, 18″, 24″ and 30″ deflector plates and re-circulating boxes can be furnished if required.

EACH Heater is self contained—consisting of Fan, Motor, Heater Coil completely encased. Heat supply for each section of the building can be controlled at will. The heating up period, in the morning, is reduced to a fraction of that required with a direct radiation system.

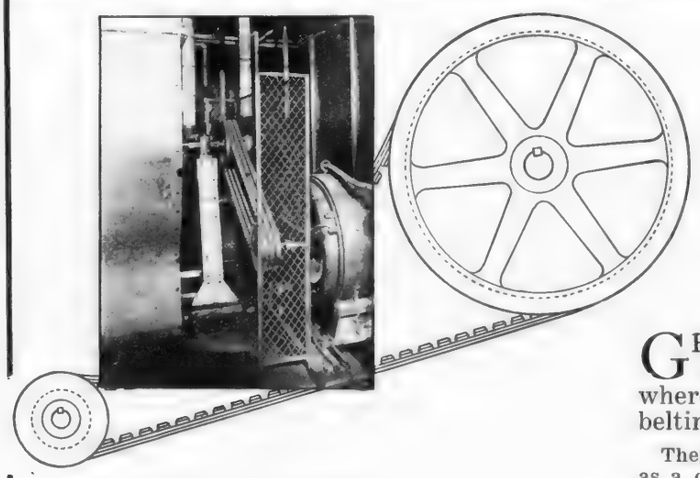
Massachusetts Unit Heaters are shipped assembled ready for operation. Type V Units are internally wired, Starting Boxes being mounted on the Unit. When in position, only steam and external electrical connections are necessary.

The Type V Unit, drawing cool air from a point just above the floor level, and discharging horizontally at high velocity just above the breathing or working zone, distributes the heated air in the breathing zone. The air inlet of Type V Unit Heaters, being just above the floor line, removes the lower strata of cool air, allowing the warmer strata in the breathing zone to fall, thus insuring a uniform temperature.

The design of the Unit Heater, is such as to enhance the appearance of its surroundings, replacing unsightly units with an efficient, mechanically correct means of heating. Ornamental grilles of pleasing appearance replace the usual cowls, elbows and baffles.

MASSACHUSETTS BLOWER DIVISION *of*
THE BISHOP & BABCOCK SALES CO.
General Offices: 4901-4915 Hamilton Ave., N. E.
Cleveland, Ohio

BISHOP & BABCOCK
TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT



Write for recommendation or data

Our Engineering Department is fully equipped and always ready to give you helpful recommendations or data on short center drives.

GRATON & KNIGHT COMPANY
Worcester, Mass.

A mere WHISPER tells you it's running

GRATON & KNIGHT "V" Belts have proved their efficiency on hundreds of installations where drives were previously inefficient with flat belting or expensive and noisy with chains.

They are as silent as a flat belt and practically as positive as a chain. They eliminate stretch because they actually work best when slack—reducing frictional losses to a minimum. They are light, silent and clean—requiring absolutely no oiling or greasing.

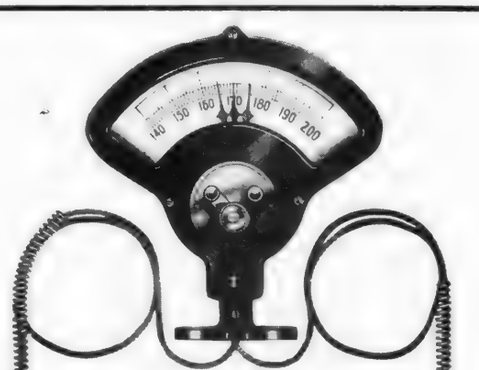
Graton & Knight "V" Belts are made of a long wearing flexible leather that never pulverizes or frays, and that absorbs the shocks of sudden heavy loads or stoppages which ruin ordinary drives quickly. Hundreds of installations testify to the fact that Graton & Knight "V" Belts outlast any other type of drive on short centers.

GRATON & KNIGHT
Standardized
LEATHER BELTING LASTS LONGER

HARTMANN
RADIATOR BRACKETS

THREE STYLES
AR NR NV

Write for Descriptive Circular and Price List
CHARLES HARTMANN CO.
997-593 Dean Street BROOKLYN, N. Y.

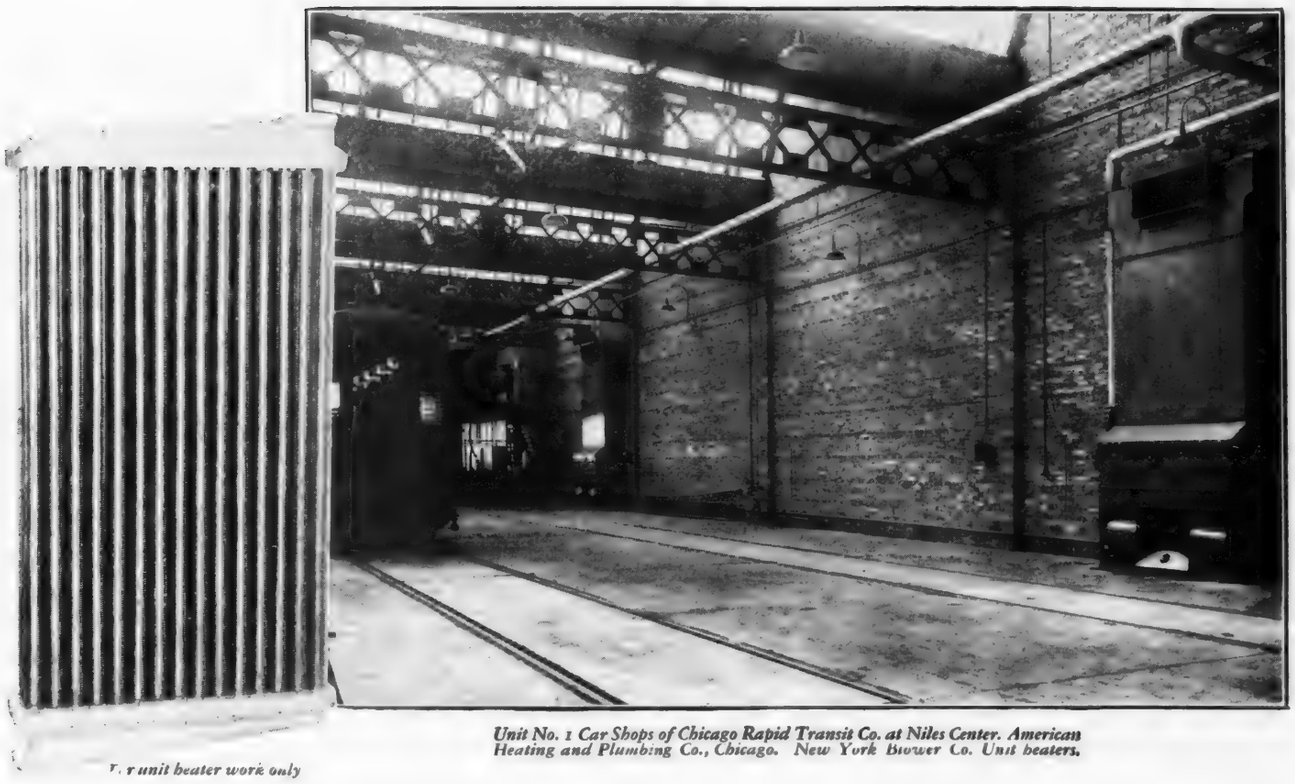


RAYMOND WEATHER COMPENSATOR

This simple instrument gives a uniform comfort from automatically controlled heating systems which has never before been approached. Write for interesting details.

OUTDOORS
BOILER

F. I. RAYMOND
258 North Keystone Ave.
RIVER FOREST, ILL.



Unit No. 1 Car Shops of Chicago Rapid Transit Co. at Niles Center. American Heating and Plumbing Co., Chicago. New York Blower Co. Unit heaters.

For unit heater work only

ARCOBLAST Exclusively in CHICAGO RAPID TRANSIT

Niles Center Car Shops

The above illustration shows a small portion of the unit heater installation in unit No. 1 of the new Chicago Rapid Transit Company Car Shops at Niles Center, Illinois. ARCOBLAST is standard equipment for all units of the complete project.

As typical of the entire job, unit No.1 is built with twelve doors which are opened up to five minutes at a time whenever a car is brought into the shops, so that in severe weather ARCOBLAST must withstand extreme changes in temperature and keep the shops comfortable enough for men to work efficiently.

These five outstanding features of ARCOBLAST led Chicago Rapid Transit engineers to standardize on ARCOBLAST for this project:

1. Rugged Unit Design.
2. No soldered Steam-backed Joints.
3. Non-corrosive.
4. Ample Tube Steam Carrying Capacity.
5. Minimum Weight without Impairing Strength.

Send for your copy of our Engineer's Data Book on the Ideal ARCOBLAST Heater. Gives roughing-in dimensions, physical data, friction data, final temperatures, condensation and pipe sizes.

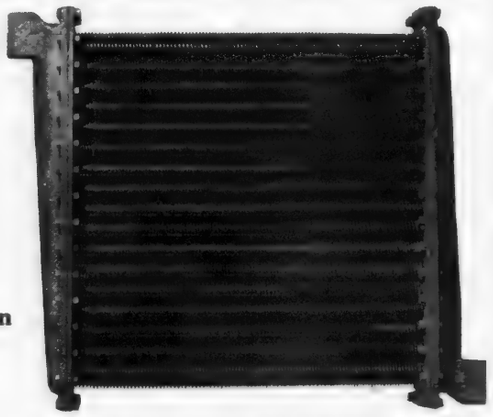
AMERICAN RADIATOR COMPANY

VENTO DEPARTMENT: 816-820 South Michigan Ave., Chicago

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

Showrooms and sales offices: New York, Boston, Providence, New Haven, Newark, Philadelphia, Baltimore, Washington, Richmond, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta, Chicago, Milwaukee, Indianapolis, St. Louis, St. Paul, Minneapolis, Omaha, Kansas City, Denver, San Francisco, Los Angeles, Seattle, Toronto, London, Paris, Milan, Brussels, Berlin.

HELICALFIN



Seamless Copper Construction

EXTENDED SURFACE RADIATION

Meets the Demands of Modern Heating and Ventilating Progress

For Permanence and High Efficiency Specify

Rome Helicalfin Tubing

Helicalfin Heater Units and Radiators offer great advantages in high efficiency. The cores consist of tubes and headers made of copper and brass. They are sturdy, compact, light in weight, and last indefinitely with practically no corrosion.

Helicalfin Heater Units and Radiators are the ideal heating equipment for Homes, Schools, Institutions and Industrial Plants.

Rome Helicalfin Radiation has from five to nine times radiating surface of plain tube with proportionate increase in efficiency.

Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

Makers of Good Radiators since 1905

ROME-TURNEY RADIATOR COMPANY
ROME, N. Y.

The Herman Nelson hiJet Unit Heater

With

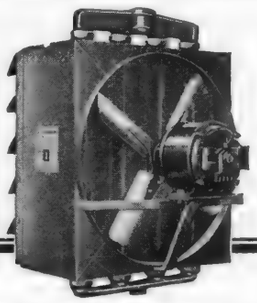
The Wedge Core RADIATOR
INDESTRUCTIBLE
TRADE MARK

Leak-proof, rust-proof, indestructible. Lower installation cost, smaller pipe lines, no reducing valves necessary. Never requires service. Freezing cannot harm it. Operating steam pressure from 1 to 150 lbs. Can be suspended from pipe lines or moved from place to place. Long range heat distribution. The ideal heating unit for

Factories · Mills · Railroad Shops · Roundhouses
Warehouses · Garages · Gymnasiums · Auditoriums

Write for our new catalogue

THE HERMAN NELSON CORPORATION
MOLINE *Makers of the* ILLINOIS
UNIVENT *and the* HERMAN NELSON INVISIBLE RADIATOR



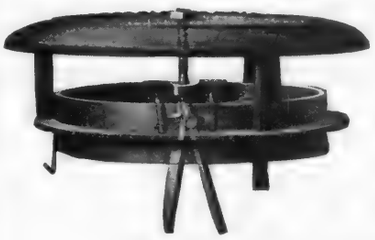
Write for your copy of the Herman Nelson hiJet Unit Heater catalogue

Be Sure You Know ALL about the ACE Automatic; Self-Cleaning AIR FILTER

before buying or specifying air cleaning equipment. ACE advantages warrant it,—for either the large or the small job. Learn why ACE is more efficient; more economical; how operation is completely automatic, even to expulsion of dirt from filter tank; how all ugly manual cleaning is eliminated, insuring unimpaired efficiency throughout service life.

Write for full details

General Air Filters Corp.
Division The W. B. Connor Co. Inc.
367 Lexington Ave., New York.

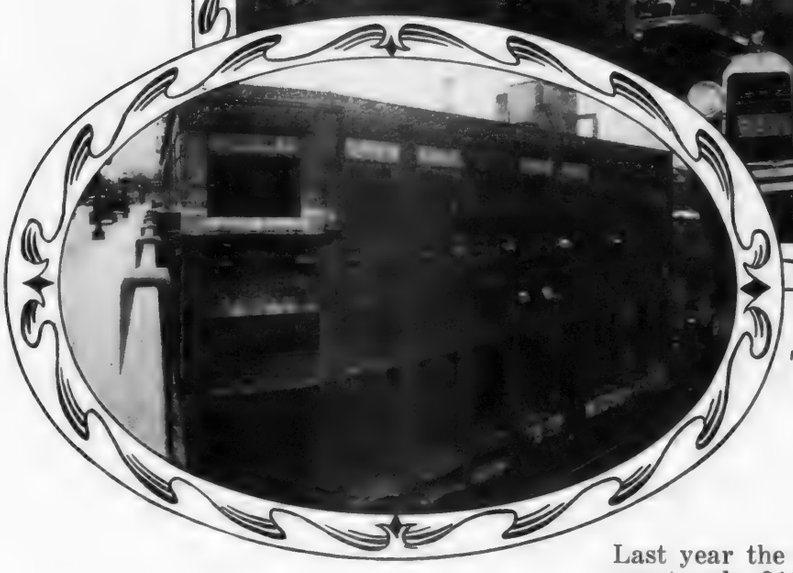


E-Z DAMPER GRIP-TITE Floor Vents

POSITIVE AIR CONTROL AT FLOOR LEVEL

ÆOLUS DICKINSON
3336-44 So. Artesian Ave. CHICAGO
(Some territory open for agents)

HEAT
with
Unit Heaters



This Entire Building Heated for Only $1600!

Last year the Pierpoint Motor Company, Pittsburgh, spent only $1600.00 on coal to heat their five-story building. This building has a floor area of 125,000 square feet.

The remarkably low heating cost is due to the efficiency and up-to-minute design of its heating system, which consists of 23 Wing Featherweight Unit Heaters. Each Wing Heater supplies heat to 5,440 square feet of floor space, on the average. During the 218 days of heating operation last winter, 397 tons of Pittsburgh run-of-mine coal were burned. The building was excellently heated on even the coldest days.

Put Heat Where it is Wanted!

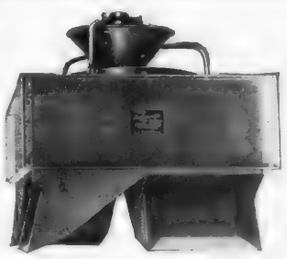
Located overhead, Wing Featherweight Unit Heaters put heat where it is wanted—that is, at the working level. They take air at the ceiling, where it is already somewhat warm, reheat it, and then deliver this warm air to the working floor, without drafts or hot blasts. Floor space is saved; heaters are out of the way of machines and mechanics; overhead temperatures are reduced; more uniform heating is maintained; and reduced coal bills result.

Send for complete information

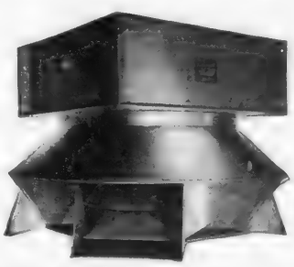
L.J.Wing Mfg.Co.

Hudson and 13th Sts., New York City

Wing Featherweight Unit Heaters



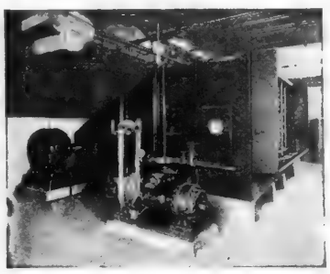
There's a size and type of Wing Featherweight Unit Heater for every industrial building.



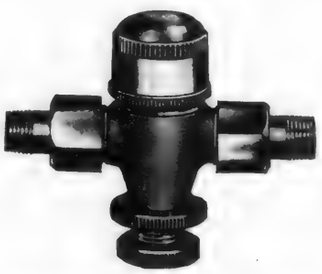
SPRACO

AIR CONDITIONING EQUIPMENT

SPRACO AIR FILTERS
FOR CLEAN AIR

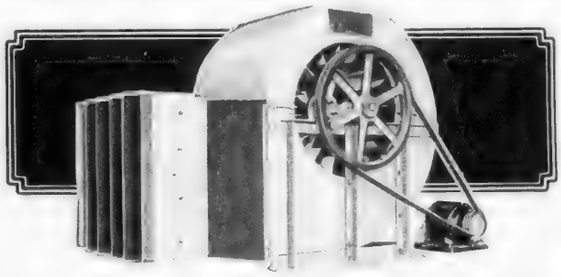


SPRACO AIR WASHERS
FOR CLEAN HUMIDIFIED AIR



SPRACO NOZZLES
FOR HUMIDIFIED AIR

SPRAY ENGINEERING CO.
BOSTON, MASS.



Good Ventilation Makes Business Good

The Lakeside Four-Way Deflector System was designed especially for use in theatres and buildings where quiet operation is absolutely essential. The patented Tex-rope Drive [wedge shaped belting] SKF Bearings throughout, specially designed and perfectly balanced impeller [installed off-center] and specially designed, quiet running low-speed motor insure freedom from noise, friction and vibration.

EASY TO INSTALL

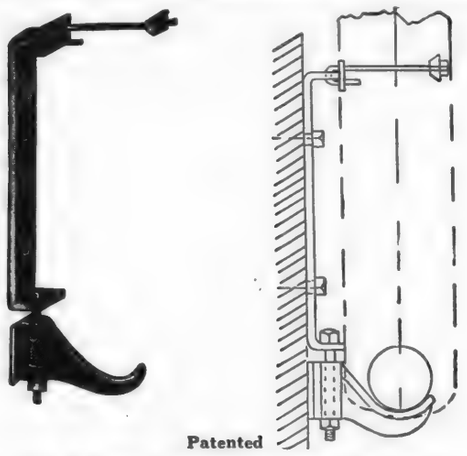
The Lakeside comes ready for installation. It requires no tearing down of walls or ripping up of floors to put in service. It is so compact that it fits into a very small space, and can be dis-assembled easily into three parts of convenient size to move through small door openings. Quickly installed, without great expense or interruption of business.

Write for Catalog which gives specifications, dimensions and capacity ratings of Lakeside Ventilators, which are made in sizes to meet practically every requirement.

LAKESIDE COMPANY, 104 Main St., Hermansville, Mich.

Lakeside

Quiet *Electric* VENTILATOR



Patented
No. 9 Bracket for Legless Column Radiation

GLEOCKLE fits them all

It is not necessary to know the make of wall radiator to be used. Just specify Gleockle Adjustable Wall Radiator Brackets and your bracket requirements will be filled. They are made to fit any make of wall radiator, and besides being convenient, they are safe, durable, inexpensive and invisible after erection.

FIT ANY MAKE OF WALL RADIATOR

Send for descriptive booklet and trade discount

A. F. GLEOCKLE, Jr.
415 Bay Street **Rochester, N. Y.**

heat! Delivered and kept where *you* want it

Thermodine Unit Heater No. 701 — there's a Thermodine for every size space.

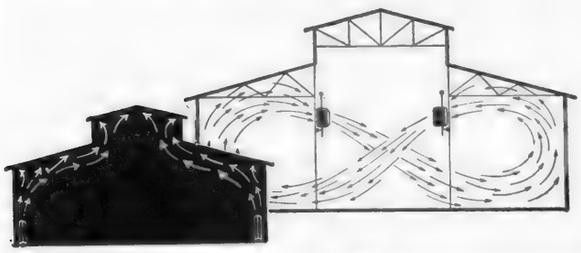


Diagram shows how Thermodine Unit Heaters circulate heated air. Below—Course of heated air circulation where c. i. radiation is used.

THERMODINE Unit Heaters not only put a generous volume of heat where it's needed—they keep it there. Keep it where it is needed most, in the working area.

The unretouched photograph above of a "smoke bomb test" graphically illustrates how Thermodine Unit Heaters project heat to the floor. And the heat rises only to the plane of the heaters where it is drawn in by the fans, reheated and again projected down to the floor. A constant circulation of heated air in the working zone. Little heat is allowed to escape above the plane of the heaters, to be wasted at the roof.

The many other advantages of Thermodine Unit Heaters warrant your closer investigation. Let us send you Catalog No. 127.

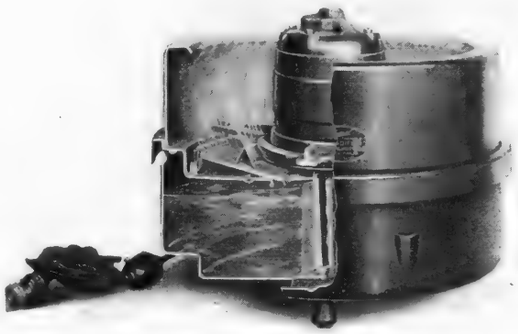
MODINE MANUFACTURING CO., (*Heating Division*)
1707 Racine St. *Branch Offices in all large cities* RACINE, WIS.

ThermoDine Unit HEATER

A MODINE Product

FOR STEAM OR HOT WATER HEATING SYSTEMS

Heat is but half of winter-time Health and Comfort *The other half is Humidity*



Patented and Patents pending.

Dealers! A real, scientific and practical Humidifier at last!

The *Braemer* PORTABLE Electric HUMIDIFIER

A new item that you can sell profitably as a Heating Specialty, *during the Heating Season.*

Perfected until it is absolutely fool-proof and trouble-free. Installed by merely inserting attachment plug in nearest outlet. Driven by small electric motor consuming less than 40 watts. (Current used only for driving motor.)

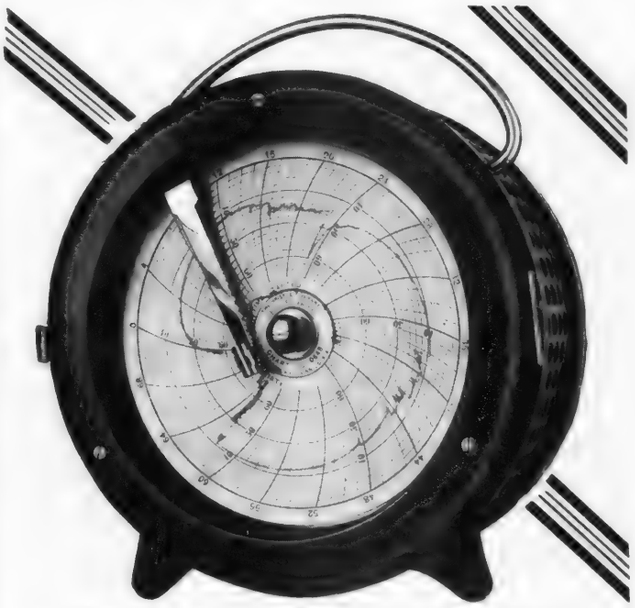
Illustration shows how it works. Fill Reservoir with water and start motor. Water rises in hollow shaft and is discharged thru nozzle upon upper surface of revolving Disk, which spreads it into thin film and throws it thru Impingement Blades. These break water into fine mist which is whirled gently outward by current from Fan, being instantly vaporized by heat absorbed from room air. Vapor diffuses evenly and quickly, effectively humidifying 4000 to 5000 cu. ft. of space. Water capacity sufficient for 14 hours.

Dealer franchises still available in prime territories. Write or wire for Demonstrator proposition.

Universal Humidifier Corp.

Offices: Denckla Bldg. Philadelphia

Sales Offices: 39 Cortlandt St. New York



Something NEW in Thermometers!

A SMALL SIZE

"Handy Bristol's Recorder"

Uses four-inch Charts. Makes continuous 3-day record of atmospheric temperatures. Easily portable; entirely self-contained. Simple, sturdy construction. Very reasonably priced. ***Complete Information in Bulletin No. 363***

The Bristol Company

WATERBURY, CONNECTICUT

Install

Powell Valves

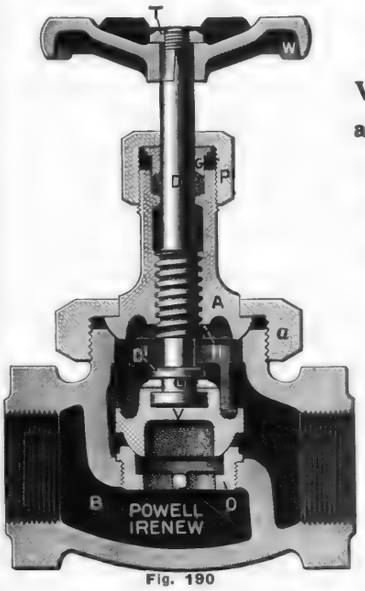


Fig. 190

And get DEPENDABLE VALVE SERVICE at a minimum cost.

All Parts Are Renewable in POWELL "IRENEW" VALVES

Iron body brass mounted on all iron.

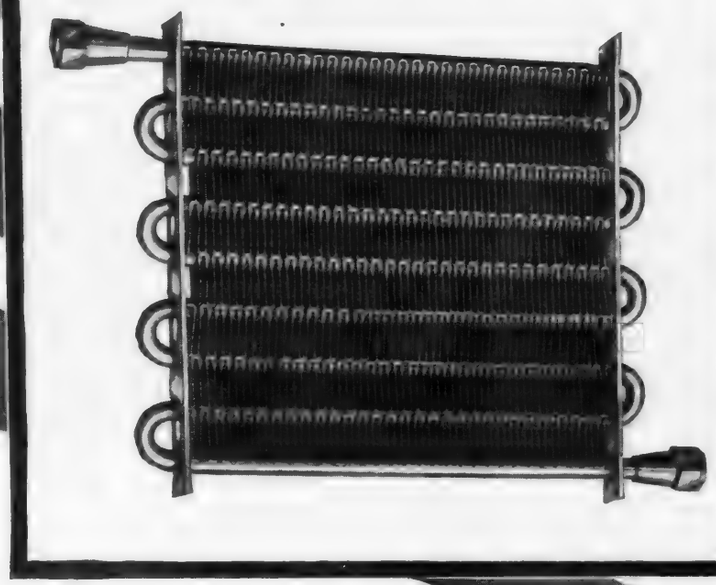
SIZES ¼ TO 3 INCHES

Write for descriptive literature.

THE WM. POWELL COMPANY

Dependable Engineering Appliances

CINCINNATI OHIO



It's New!

Here is the latest and most efficient—application of the fin-tube to air conditioning devices . . . it cannot leak because the tube is continuous without a single joint. There is more fin per inch. The contact between fin and tube is positive. The construction is rigid.

This new development is another expression of our ability to serve the Heating and Ventilating industry. We offer our cooperation in applying the Wolverine Fin-tube —*patent applied for*— to air conditioning devices. Address Fin-tube Division.

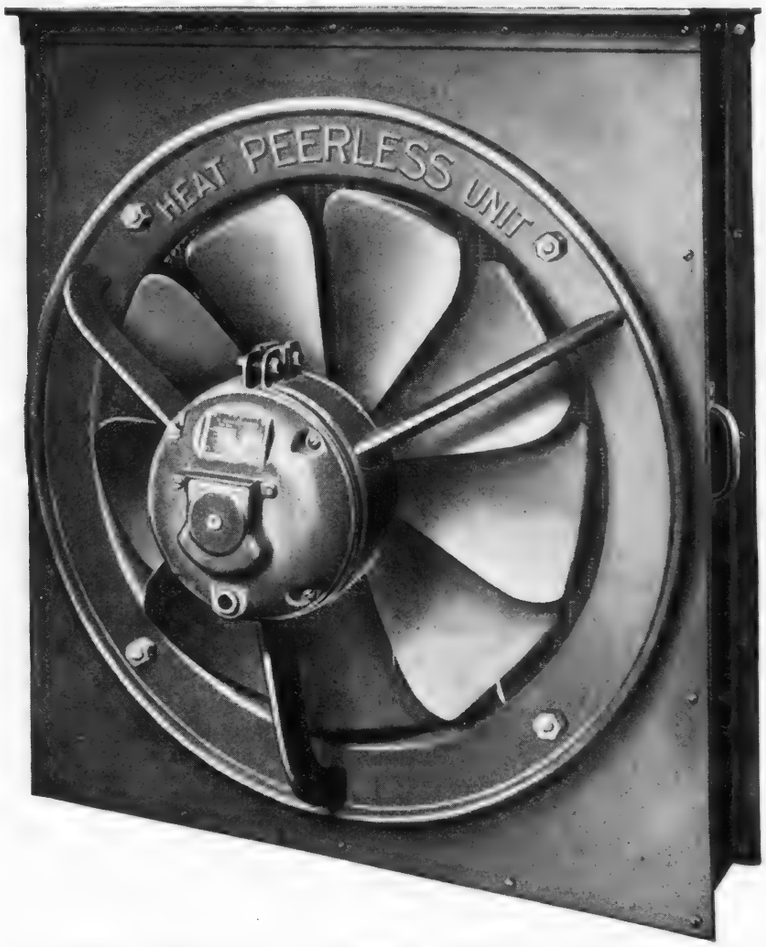
WOLVERINE TUBE COMPANY
1415 CENTRAL AVENUE DETROIT, MICHIGAN

Sales Offices:
Atlanta, Ga., 411 Georgia Savings Bank Bldg.; *Chicago, Ill.*, 129 S. Jefferson St.; *Cleveland, Ohio*, 602 Hunkin-Conkey Bldg.; *Dayton, Ohio*, 908 Dayton Savings Bank Bldg.; *Denver, Colo.*, 1715 California St.; *Los Angeles, Cal.*, 224 E. 11th St.; *Rochester, N. Y.*, 206 Central Trust Bldg.

WOLVERINE TUBE

SEAMLESS COPPER & BRASS TUBING

Members of Copper & Brass Research Association *Standard Sizes of Copper Tubing Carried in Stock*



Better Heating at Lower Cost with Unit Heaters

SUBSTANTIALLY LOWER FIRST COST — quicker heating of working zone—uniform heating throughout the room—easier control of room temperature—

This page and several more could be filled with these and other strong arguments for the Peerless unit system of heating industrial buildings.

But you already know these arguments, and you know that they are true. The important point is: Are you profiting by this modern system?

The booklet shown at the left may help you. Send for it.

Peerless Unit Heaters are made in the same shops which produce the well-known PeerVent Heating and Ventilating System, used in school buildings throughout the country.

PEERLESS UNIT VENTILATION CO., Inc.

718-34 Crescent Ave., Bridgeport, Conn.

NEW YORK, 369 Lexington Ave.; BOSTON, 100 Boylston St.; BUFFALO, 135 University Ave.; HARRISBURG, 705 Telegraph Bldg.; CLEVELAND, 1836 Euclid Ave.; DETROIT, 1214 Lafayette Bldg.; CHICAGO, 808 Monadnock Bldg.; MINNEAPOLIS, 240 Seventh Ave. S.; PORTLAND, ORE., 927 Board of Trade Bldg.; TORONTO, CANADA, Darling Bros., Ltd., 77 York St.

Mail this! with your letterhead, please

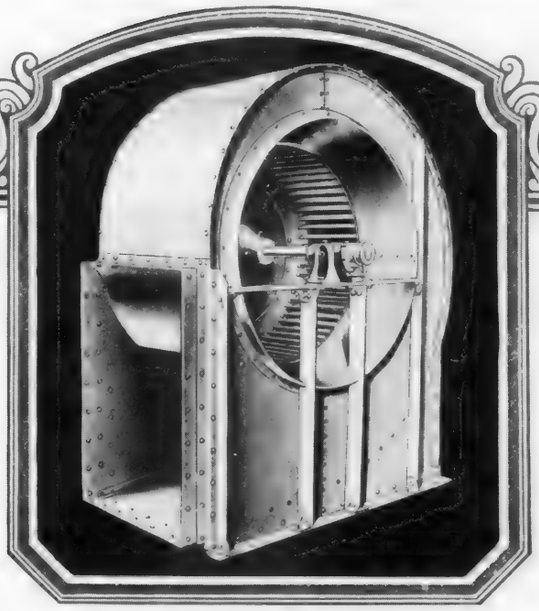
To Peerless Unit Ventilation Co., Inc.,
718-34 Crescent Ave.,
Bridgeport, Conn.

☐ Send booklet about Unit Heaters.

☐ Send your local representative.

H

PEERLESS
UNIT HEATER



TYPE ME FAN

"The Fan with a Degree"

Realizing that the success of heating, ventilating, and air conditioning systems depends on the fan for economical and positive operation, Architects and Engineers specify the ME Fan outright.

It Will Pay You Well to Investigate

Before you decide on the heating and ventilating, investigate the efficient and quiet performance of the ME Fan—the fan that enjoys an exclusive record for high efficiency—*verified* in the laboratories of two great universities.

Type ME Fan offers the architect, engineer and user—

1. **Large capacities for space occupied**
2. **Low rpm and tip speed for a given pressure**
3. **Noiseless operation**
4. **Economical operation**
5. **Durability—no maintenance expense**
6. **And above all—ratings and capacities that have been definitely established and guaranteed accurate beyond question.**

Write for Your Copy

Complete description with engineering data is contained in Catalog No. 100, with interesting information covering the tests made in two Universities.

(A. I. A. 30d1)

Representatives in Principal Cities

Fans — Blowers
Unit Heaters
Air Washers
Furnaces

NEW YORK BLOWER COMPANY

General Offices
2242 So. Halsted St.
Chicago, Ill.

HEAT *and* VENTILATE MECHANICALLY—USE ME FANS *for* BEST RESULTS

A New Measure of Instrument Value!

THE
FOXBORO CO., INC.
GUARANTEES TO REPAIR OR REPLACE, FREE OF CHARGE FOR ONE YEAR FROM DATE OF SHIPMENT, ANY INSTRUMENT THAT DOES NOT PROVE PERMANENT IN CALIBRATION AND FREE FROM DEFECTS IN WORKMANSHIP AND MATERIAL.
BEFORE REMOVING THIS SEAL
READ THE GUARANTEE AND INSTALLATION INSTRUCTIONS.
FINAL INSPECTION
BY 241
FOXBORO
REG. U.S. PAT. OFF.

HERE is a definite pledge which establishes a new measure of instrument value. It is the Foxboro Guarantee of permanent calibration, workmanship and materials sealed to each recording and controlling instrument.

This sealed guarantee is tangible evidence that the instrument is capable of performing the work for which it is designed.

If it were not for the years of technical research, the accumulation of practical knowledge of instrument requirements in many industrial fields and the perfection of details to meet these varied requirements, such a guarantee would not be possible.

The superior accuracy and performance of Foxboro Instruments have been demonstrated for years in heating and ventilating installations.

Foxboro performance is a KNOWN QUANTITY. That's why it can be guaranteed.

When you need accurate and dependable instruments of KNOWN QUALITY, write or wire our nearest branch office.

THE FOXBORO COMPANY

Neponset Avenue, Foxboro, Mass., U. S. A.

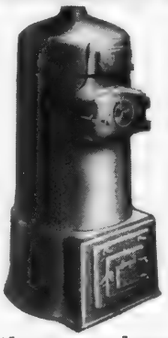
New York Chicago Philadelphia Boston Pittsburgh
Detroit Cleveland Tulsa Rochester Atlanta
San Francisco Los Angeles Portland, Ore.

FOXBORO

REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY

How One Small Burnham Does Double Service



The house is a big one, with three bath rooms. The main heat is supplied by a hot air system. One of our Junior Round Boilers was installed to supply hot water for the bath rooms, laundry and kitchen. Later on, radiators were connected with it to give auxiliary heat in three rooms, bath rooms included. Yet the Junior goes right on giving the double service, with its usual surprisingly low fuel consumption.

Name of owner and location of residence gladly given.

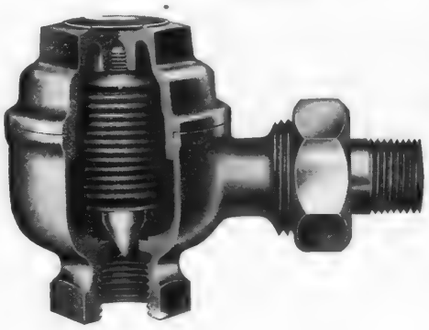
Have you a problem like that to prescribe for? Then the Burnham Junior is your answer.

Burnham Boiler Corporation

Irvington, New York

Representatives in all principal cities of the United States and Canada.

THERMOFLEX RADIATOR TRAP with the "Hydron Bellows"



Something more than "Just Another Radiator Trap." Well worth specifying and using.

Write for booklet describing the Hydron Bellows, and complete data on Thermoflex Vapor and Vacuum Heating Specialties and Automatic Boiler Feeders.

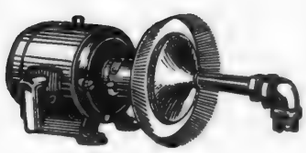
Manufactured by

W. D. CASHIN COMPANY

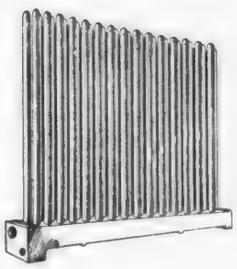
35 Hartford Street **Boston, Mass.**

Plexiform Fans

The design of Bayley Plexiform Fans is based on modern requirements of a centrifugal discharge fan: maximum air delivery against low or medium high resistance, from a minimum of housing; highest obtainable mechanical efficiency, strength, lightness, *quietness in operation* and method of construction as equally adaptable to high as to low pressures and as practicable for double as for single width fans. It embodies to the fullest extent the well-known features of relatively small housings with large inlets and outlets, as standardized by leading manufacturers of air moving apparatus and accepted by engineers and architects generally.



The Bayley Turbo-Atomizer, heart of the Bayley Air Washer. Operates at nominal water pressure with a power saving of 40 to 60% as compared with the high pressure multiple spray system.



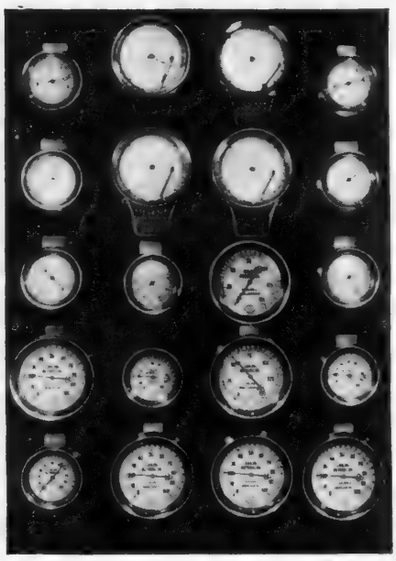
Bayley Chinook Heater — the most improved form of Indirect Heater. Construction is such that there are no return bends, elbows or nipples. Permits use of steam at either high or low pressure.

Write for Catalog No. 26, containing valuable reference data.

BAYLEY BLOWER COMPANY
742 Greenbush St., Milwaukee, Wis.

Bayley
AIR ENGINEERING & EQUIPMENT
HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS—PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

GAUGE BOARDS



American Gauge Board in American Insurance Union Bldg., Columbus, Ohio.

Cooling Methods, Inc., Columbus. Heating Contractors.

The beauty of modern buildings is not confined to exterior appearances. It is extended throughout the offices, lobbies, and even to the engine room.

And instruments can be beautiful as well as accurate and reliable. They must be—to fit into the modern scheme.

American Gauge Boards are made complete with Indicating Gauges, Recording Gauges, Dial Thermometers and Recording Thermometers. They make ideal Power Plant installations.

The consulting engineer who specifies American Gauge Boards is doing a service.

WRITE FOR FOLLOWING CATALOGS:

Gauge Catalog A-14
Recording Gauge Catalog E-14
Gauge Tester Catalog D-14
Valve Catalog V-14
Dial Thermometer Catalog G-14
Thermometer Catalog F-14
Recording Thermometer Catalog H-14
Tachometer Catalog J-14
Steam Trap Catalog S-14
Temperature Controller Catalog R-14

AMERICAN INSTRUMENTS

American Schaeffer & Budenberg Corporation

338 Berry St., Brooklyn, N. Y.

Branches in Principal Cities

Makers of American Industrial Instruments since 1851.

CAPITOL

Steam Radiator Valve

The No. 41 Steam Valve, like all Capitol products, is made of sturdy steam metal composition, carefully machined, assembled and tested before shipment.

The mushroom type handle is of a black, fibre composition and is fastened securely to the stem by a strong, blue chipped steel screw.

Eliminate customer complaints by using Capitol brass valves and boiler trimmings on all your jobs. Write for catalog showing complete line.

No. 41

Michigan Smelting and Refining Co. now operating Capitol Brass Works

CAPITOL BRASS WORKS

MANUFACTURERS OF BRASS VALVES, BOILER TRIMMINGS AND PLUMBERS' BRASS GOODS

DETROIT, MICH.

CENTRAL STATION STEAM CO.

2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 450° F.
Our No. 2600 metal for temperatures below 1500° F.
Other High Heat Metals for special uses.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
Detroit, Michigan

The **SIMPLEX** *is available in ten sizes, ranging from* 800 *c.f.m. to* 40,000 *c.f.m., in single units. Deliveries made from stock. Dimension tables and prices on request.*

Introducing the latest—"The Simplex"

The *SIMPLEX* Air Filter has been developed in response to a definite demand from architects and engineers. Briefly, it is a combination of the Rotary and the Phoenix, utilizing the medium of the one and the cleaning principle of the other.

The *SIMPLEX* will find its best application in the field of general ventilation, where its high efficiency, rugged construction and trouble-proof operation make it an ideal apparatus to fit conditions prevailing in the average installation. It is entirely self-cleaning, and can be had either fully automatic or semi-automatic in construction.

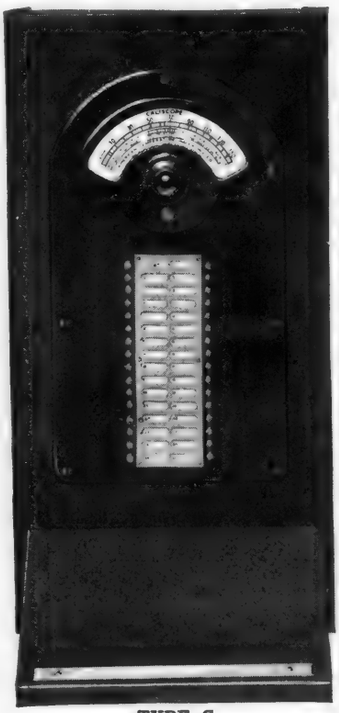
The drum construction of the *SIMPLEX* permits of considerable flexibility, with respect to the density and arrangement of the filter medium. The heavy mat of twisted copper ribbons, wound layer upon layer, is made in one unbroken piece . . . . there are no seams or joints to invite air leakage or oil entrainment.

As the name implies, the *SIMPLEX* is simplicity personified, both in design and operation. It is sturdy in construction, and so simple that there is absolutely nothing to get out of order. The servicing of the system is limited to a mere turning of the drum a few times a month (this can be automatic or manual as preferred). The oil is kept clarified by the simplest of all processes—sedimentation. The dirt is ejected by a few turns of the ejector at infrequent intervals. The oil film is kept in constant renewal as the drum is rotated.

NATIONAL
AIR FILTER COMPANY
NATIONAL

5130 Ravenswood Avenue, CHICAGO

The American System of Temperature Indication



TYPE C

The Caliscope

is an electric device used for the remote indication of both wet and dry bulb temperatures, and without further use of charts or calculation, shows the comfort zones or the correct relation between the temperature and the moisture content of the air for the comfort of the occupants.

It centralizes your control and supplies the intelligence to properly operate the heating, ventilating and refrigerating systems.

ACCURATE and DEPENDABLE

OUR "NEW" SINGLE UNIT

CALISCOPE

TYPE A

The Type A Caliscope is especially adapted for indicating temperatures where only a few elements are required in theatres, offices, public buildings, apartments, factories, cold storage plants and greenhouses.

This instrument is simple to install and guaranteed permanent in calibration.

Furnished complete with Thermoscope (dry bulb room element) including wire up to 300 feet.

Price $65.00

The American Temperature Indicating Co.

1017 Summit Street TOLEDO, OHIO

BOOKS ON HEATING AND VENTILATION

THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS, by F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Doctor Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

PLUMBERS' HANDBOOK, by Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

HOUSE HEATING WITH OIL FUEL, by P. E. Fansler, Associate Editor of The Heating and Ventilating Magazine. Prepared for the use of heating and ventilating engineers, heating contractors and those engaged in the oil-burner industry. One of the outstanding features of the book is the presentation of the subject of oil combustion. Over a dozen beautiful and spectacular flame photographs were made particularly for this book in order that the subject of oil combustion might more thoroughly be presented. Three chapters are devoted entirely to the discussion of salient points of the outstanding oil burners that are on the market to-day. The chapter, "Oil Burners Listed by the Underwriters," is the only authentic, chronological list of oil burners that has been listed by the Underwriters in the past. 32 chapters totaling 362 pages and more than 150 illustrations. Size 7 x 10. Price, $4.00 postpaid.

HEATING AND VENTILATION, by the late John R. Allen and J. H. Walker. This is the second edition of this work and has been brought up to date in every particular, including the latest radiator transmission factors put out by the Research Laboratory of the A. S. H. & V. E. and the Hill synthetic air chart testing method. Especially adapted for use as a text book. Size 6 x 9 in. 322 pages Cloth, $3.50.

A. S. H. & V. E. GUIDE, 1928, sixth edition, with previous sections revised and brought up to date. Includes new tables covering heat transmission from building construction, and comprehensive tables for figuring pipe sizes for gravity, vapor, and vacuum steam heating systems, based upon A.S.H. & V.E. Research Laboratory tests on one and two-pipe steam riser capacities. Size 6 x 9 in. 680 pp. and list of A.S.H. & V.E. members. Cloth $4.00.

DESIGNING, HEATING, AND VENTILATING SYSTEM, by Charles A. Fuller. A treatise on the practical application of the engineering rules and formulas in every day use, in laying out steam, hot water, furnace and ventilating equipment for buildings of all kinds, presented in a simple manner. Price $3.00.

HEATING AND VENTILATION, by Charles W. Brabbée. This is the first American edition of the famous Heizungs-und Luftungstechnik, by Dr. H. Rietschel, and C. W. Brabbée, translated from the seventh German edition, edited and revised to make it adaptable to conditions in the United States. Supplemented by 7 charts covering steam and water heating and ventilation. Size 6 x 9 in. 332 pp., cloth $2.50.

PRACTICAL STEAM, HOT WATER HEATING AND VENTILATION, by Alfred G. King. Containing 396 illustrations. The book is a working manual for heating contractors, journeymen, steamfitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8 vo. 367 pages. Price $4.00.

MECHANICS OF HEATING AND VENTILATING, by Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the results of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten, $15.00.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS, by James D. Hoffman. Fourth edition of this important work entirely rewritten and reset. A standard manual covering theory and practice, with special chapters on heat losses, furnace heating, water and steam heating, mechanical vacuum heating, mechanical warm-air heating, temperature control, electrical heating and refrigeration. With appendix of 75 tables. Size 4½ x 6¾ in. Pp. 478. Price $4.50 postpaid.

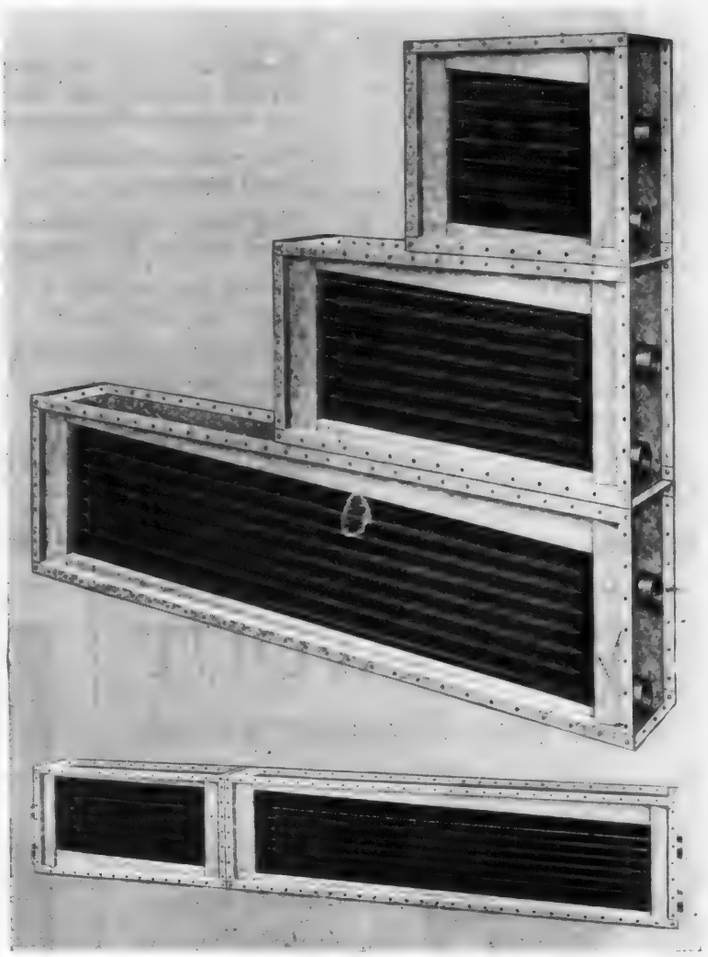
HANDBOOK OF THE NATIONAL DISTRICT HEATING ASSOCIATION. Devoted to data on all phases of central station heating work, including generation, distribution, utilization, meters and water heating, compiled by the Association's Educational Committee. All new and revised data for this book will be supplied free for five years. Bound in leather, with six-ring binder. Price $5.00, postpaid.

THE HEATING and VENTILATING MAGAZINE
386 FOURTH AVE., NEW YORK

YORK SUPER-FIN

An Accomplishment in Heating and Air Engineering

1. No joints to leak—*welded*.
2. For high or low pressure.
3. A high-pressure heating surface at low-pressure prices.
4. Expansion and contraction strain between tube and header positively eliminated.
5. Supply and return at same end.
6. Units can be set end to end.
7. Copper tube with copper fins permanently bonded. No solder or tin.
8. Smooth fins. (Minimize dirt collection.)
9. Tested to 1000 pounds hydrostatic pressure.
10. Built for 1, 2, 3 and 4 nominal depths of pipe in one casing.
11. Casings 12″ thick, either 23″ or 35″ high, in several lengths.



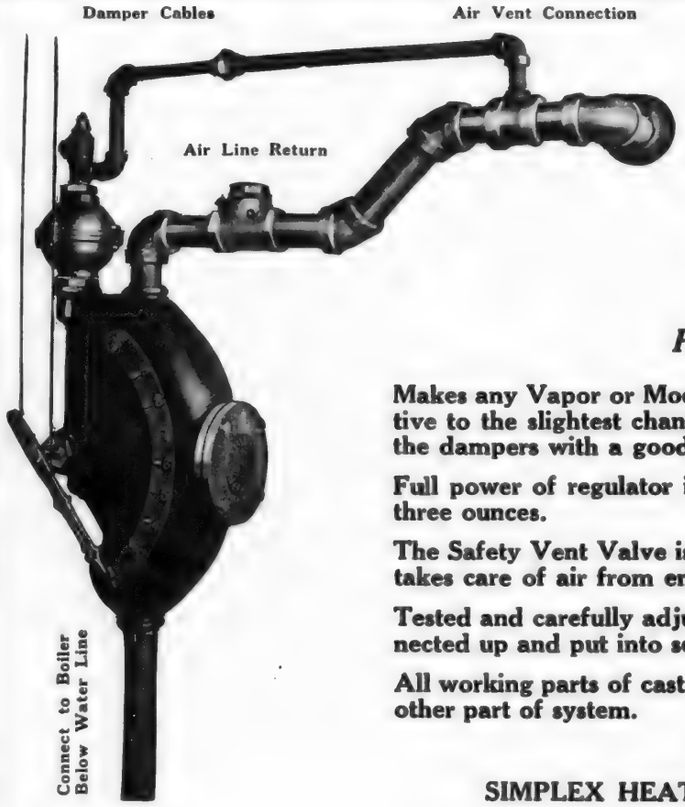
YORK SUPER-FIN, now announced after several years' intensive engineering research, embodies a combination of new features never before achieved. These features eliminate weaknesses of extended surface construction, create greater flexibility in combining units and avoid difficulties of either high or low pressure operation, all within a remarkably reasonable price range.

Write for full information to York Heating & Ventilating Corporation, 1506 Locust Street, Philadelphia.

YORK SUPER-FIN RADIATION

YORK HEATING & VENTILATING CORPORATION, PHILADELPHIA

Engineered Products . . . Manufacturers of the Famous York Heat-Diffusing Unit



Wiley

Safety-Vent Vapor Regulator

POWER IS ITS MIDDLE NAME

Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

Write for details

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.

SWARTWOUT
Cast Iron Exhaust Head

Built to last a lifetime.

Bucket Type Steam Trap
Steam Separators
Return, Lifting and Vacuum Steam Separators—Receiver Type
Low Pressure Float Trap
Cast Iron Strainer
Air Separator

THE SWARTWOUT CO.
General Offices: 18525 Euclid Ave., Cleveland, Ohio
Factories: Cleveland and Orrville, Ohio

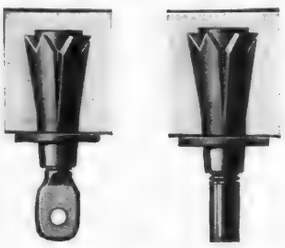
A 2c Stamp

will bring you information on any item below. Check off those items in which you are interested, mail to us, and you will receive this catalog, prices, and whatever you may need in the way of information on any Atlas product.

☐ Reducing Valves ☐ Float Valves
☐ Damper Regulators ☐ Swing Joint Fittings
☐ Temperature Regulators ☐ Bronze Unions
☐ Thermostats
☐ Pump Governors ☐ Balanced Valves

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

PHILLIPS
Self-Drilling Expansion Shells



For use in ceilings, walls, floors and beams for fastening pipe hangers, etc., and bolting timber and other equipment to concrete and stone.

Quickly installed with the PHILLIPS SPRING HAMMER or by hand. No drills required. Every shell makes its own hole.

Phillips Drill Company
1537 Cortland St., Chicago

The United States Ozone Company

Announces that—

THE Electric Water Sterilizer & Ozone Company of Scottdale, Pa., who formerly manufactured our equipment in accordance with our plans and specifications, passed into bankruptcy during August of 1926. Subsequent operations of the Receivers and Trustees in bankruptcy proved unsatisfactory, necessitating manufacture of the equipment under the direct supervision of our own highly experienced and well-trained staff of engineers and technologists who pioneered the ozone industry in America.

The change has afforded an excellent opportunity for a complete revision of our standard line, without delay in deliveries, together with an additional important development in Radi-ion ionizers for ventilation work. We are now in a position to make deliveries more prompt than ever before in our history.

We wish to add that we have no connection whatsoever with the recently incorporated United States Ozone Company of America, Scottdale, Pa., whose officers are: Pres., E. Ralph Loucks, Banker; Vice. Pres., Robert Norris, Banker; Sec. & Treas., Charles Loucks, Banker.

THE UNITED STATES OZONE COMPANY

GENERAL OFFICES AND LABORATORY

500 N. Dearborn Street,

Chicago, U. S. A.

Fred H. Montgomery, President

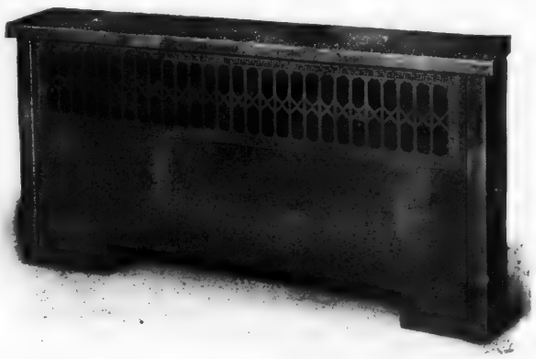
Frank E. Hartman, Vice-Pres. & Chief Chemist

W. Ray Montgomery, Sec. and Treas.

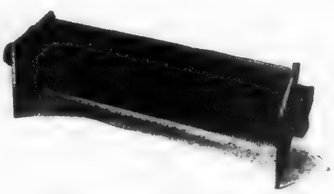
Canada: Darling Bros., Ltd., 120 Prince St., Montreal.

Representatives in all principal cities

Pacific Coast: Montgomery Brothers, 61 Freemont St., San Francisco.



Convecto Cabinet



Convecto Cabinet
Heat Unit
Light in weight—Compact

Convecto Radiators and Heat Cabinets

For the modern home, apartments, and public buildings, meet the present requirements of the heating engineers and architects with advanced ideas.

Convecto Radiators are made for all purposes. Heat units are all copper, and manufactured under a patented expanding process, the only extended surface radiation of its kind made. The heat units are rugged in construction and made for lifetime service.

Convecto Cabinets are capable of finish and artistic appearance to meet the requirements of people of refinement and taste.

Complete Information in our new catalog just issued.

METAL STAMPING CO.

Long Island City New York, N. Y.

NO FORCED DRAFT

Breaking the Record for Low Coal Bills and Efficiency!

Low pressure steam and hot water heating boilers and tank heaters that burn No. 1 Buckwheat . . . . . No mixing with expensive coal . . . . . Magazine needs filling only once in 12 to 24 hours . . . . . No blower. No motor. No electric current. No machinery to get out of order . . . . . Twenty-one sizes . . . . . *Coal bills cut one half!*

Have you our Catalog and Price Sheets?

The MOLBY HEATING BOILER

and Heavy Duty Tank Heater

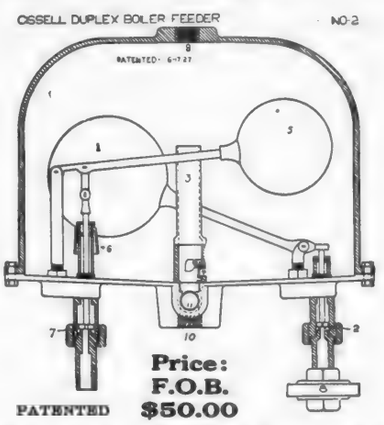
MOLBY BOILER COMPANY

(Subsidiary of The Universal Pipe and Radiator Company)
New York: Graybar Building, 420 Lexington Ave.
Landsdale, Pa.: 41 Central Ave.

Now is the Time

For Real Boiler Protection

While Also Increasing Its Efficiency



PATENTED

Price: F.O.B. $50.00

This Duplex feeder, built especially to meet conditions existing in heating boilers, will make your boiler absolutely automatic, eliminating danger of burning boiler or cracking sections. In selecting a boiler feeder you want the best; thousands of these feeders are in use and never a complaint. So sure are we as to its efficiency, that we sell it with an ABSOLUTE GUARANTEE.

Write for Full Particulars and Discount

Manufactured by

W. M. CISSELL MFG. CO., INC.

111 South Second Street LOUISVILLE, KY.

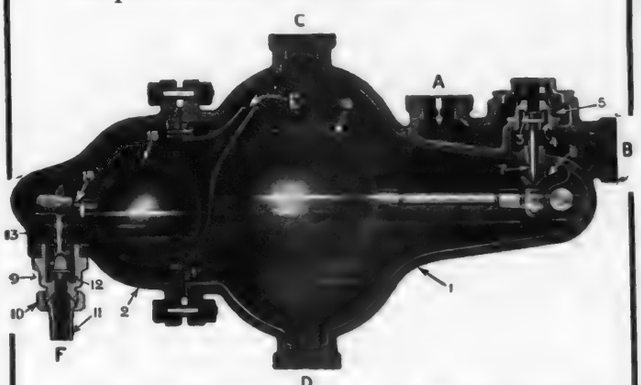
Whose Fault when the boiler BURSTS?

Is it fair to blame it onto the owner who believed he was buying a good heating plant? Or the boiler manufacturer who provided a serviceable boiler that should last year in and year out?

Regardless of whose fault it is, the boiler burst—when it could have been positively protected by the McAlear Water Feeder.

McAlear automatic water feeders give dependable protection to Coal, Gas and Oil-fired boilers.

McAlear Water Feeders for oil burners will positively supply automatically the necessary make-up water to the boiler, and discharge all surplus water into the sewer.



The McAlear will cut out the oil burner at the low water danger point, and cut out the oil burner at any steam pressure point desired!

Complete details regarding the McAlear Direct-to-Boiler Water Feeders, including blue print showing application and roughing-in dimensions, are furnished in our Bulletin K.

Write for your copy of this bulletin today.

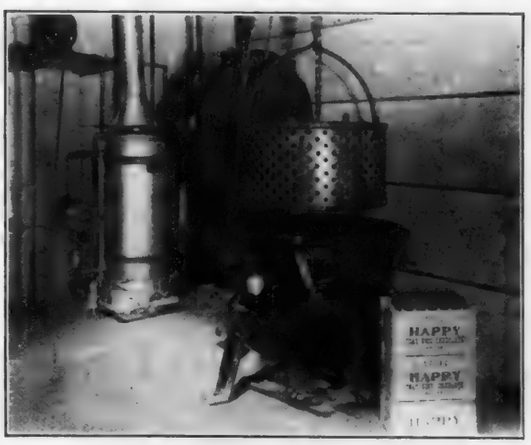
McALEAR

MANUFACTURING COMPANY
19th and Western
CHICAGO, ILLINOIS

Another day another way to use Steam from an

"Steam in 4 minutes"
Ofeldt
TRADE MARK

WATER TUBE
Automatic Gas Boiler



A 7-H.P. OFELDT Automatic Gas Boiler in a Bottling Plant supplying steam to a Sprague-Sells sterilizer.

The Pasteurization of a popular chocolate drink is accomplished by placing filled and capped bottles in the sterilizer. The capacity of the sterilizer is 480—6½ ounce bottles.

The cover is securely fastened and, with steam from the OFELDT Boiler, a temperature of 240° is maintained for one-half hour. During the loading and unloading of the sterilizer a great saving of fuel is realized, as maximum gas is burned in the boiler only when steam is used.

MEARS-KANE-OFELDT, INC.
Manufacturers of
GAS FIRED BOILERS AND WATER HEATERS
1903-1915 EAST HAGERT STREET PHILADELPHIA

NEW YORK OFFICE: 9-15 PARK PLACE

DISTRICT REPRESENTATIVES

Chicago, Ill., Monarch Sales & Eng. Co., 363 W. Erie St.
St. Louis, Mo., Monarch Sales & Eng. Co., 2010 Locust Blvd.
Birmingham, Ala., Southern Industrial Eng. Co., Amer. Trust Bldg.
Los Angeles, Cal., R. G. Meyler Corp., 940 S. Maple Ave.
Boston, Mass., E. D. Knapp, 100 Arlington St.

KELLY
No. 2 Vacuum Valve

That "KELLY AIR VALVES ALWAYS MAKE WARM FRIENDS" is a well known fact. Why? For the reason, that they are the most effective valves ever designed and manufactured by us.

Simplicity of parts. Absolutely positive in action.

Compare the design of KELLY VALVES with that of other makes.

Every "KELLY" valve is subjected to a practical Steam and Vacuum test before shipping and all valves are GUARANTEED FOR FIVE YEARS.

Be convinced. Greater value for less money.

Prove what we say to your own satisfaction by comparative tests in actual service.

Manufactured by

KELLY BRASS WORKS

General Office and Works

226 W. Ontario Street, Chicago

Represented in most leading cities

National No-Coil Hot Water Storage Tank

For use in Hotels, Clubs, Apartment and Public Buildings, or any place where a large amount of hot water is used.

The National No-Coil Hot Water heater supplies a large volume of water hot continuously. This is accomplished by the steam jacket which is welded to the shell of the tank. This method affords a large amount of heating surface and assures quick response. Steam jacket is properly proportioned to heat the contents of tank with steam pressure not exceeding five pounds.

Tanks are for horizontal installation, tested to hydrostatic pressure of 150 lbs. to the square inch and guaranteed for working pressure of 100 lbs.

There is a suitable size for every requirement. Let us send full details.

National Steel Tank & Mfg. Company
BRADFORD, ILLINOIS

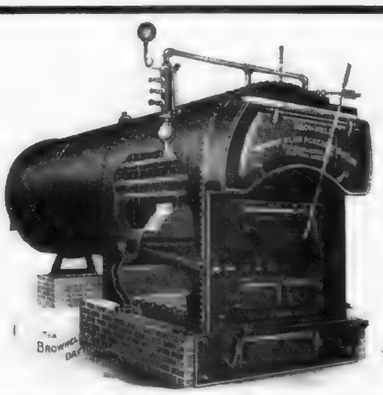
BROWNELL BOILERS

Long before anybody knew what a telephone looked like, John Brownell began to build boilers, and the third generation is still at it. From the very first unit developed back in 1855 down to the magnificent product of today the absolute best of everything has gone into the product.

Best materials. Latest designs. Riveted steel construction of accurately known strength. Most rigid factory inspection.

Brownells are in use the world over. Brownell representatives (in all principal cities) stand ready to consult with you. Bulletin B-6A containing a model suited to your particular heating requirements ready to send to you.

THE BROWNELL COMPANY, Dayton, Ohio

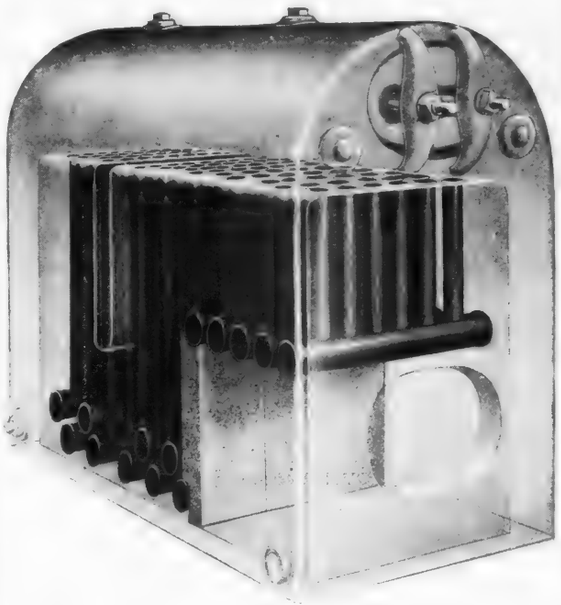


Brownells comply with A.S.M.E. and all state codes.

JOHNSTON

Electric Welded

Steel Heating Boiler



OIL BURNER TYPE

Heat is created by the burner, but the boiler must transform that heat into useful energy.

No matter how efficient the burner may be, it must be combined with an efficient boiler in order to deliver heat to the owner at the minimum cost of operation.

Translated into dollars, the saving pays a surprisingly big investment return on the cost of the boiler.

The lowest fuel cost can only be obtained in a boiler designed and built expressly for oil burner service.

Johnston Brothers, Inc.

FERRYSBURG, MICHIGAN

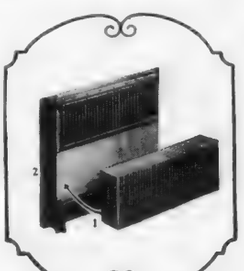
RADIATORS...*with beauty and space-saving combined*

Mr. Ashton Hamilton Residence, Brockton, Mass.
—equipped with Herman Nelson Invisible Radiators

ALL the advantages of radiator heat—free play of charming interior effects—with the radiator out of the room—this is the marvelous new opportunity awaiting progressive heating contractors in the sale of Herman Nelson Invisible Radiators.

Once walled-in, this compact modern heating unit, with exclusive wedge-core, is forever out of sight and mind. Indestructible and leak-proof, it never requires servicing. Even freezing cannot harm it.

The Herman Nelson Invisible Radiator is being installed in the better homes, offices, banks and similar buildings — everywhere. Find out how it will add to your prestige and profit. Full information comes in Book 39. Send for it.



Radiator (1) comes installed in a steel case (2) more substantial than the wall itself. The complete unit is ready to install in any standard wall or partition.

THE HERMAN NELSON CORPORATION,
MOLINE, ILL.
Builders of Successful Heating and Ventilating Equipment for Over 20 Years

Sales and Service

BELFAST, ME.			ATLANTA
BOSTON			MEMPHIS
NEW HAVEN	WASHINGTON, D.C.	TOLEDO	SAN FRANCISCO
NEW YORK CITY	ERIE	INDIANAPOLIS	EMPORIA
UTICA	CHARLOTTE, N.C.	CHICAGO	KANSAS CITY
SYRACUSE	GRAND RAPIDS	DES MOINES	DENVER
BUFFALO	SAGINAW	MILWAUKEE	SALT LAKE CITY
PHILADELPHIA	DETROIT	GREEN BAY	SPOKANE
SCRANTON	CLEVELAND	MINNEAPOLIS	PORTLAND
PITTSBURGH	COLUMBUS	ST. LOUIS	SEATTLE
	CINCINNATI	BIRMINGHAM	
VANCOUVER	TORONTO	WINNIPEG, MAN.	

HERMAN NELSON *Invisible* RADIATOR

With

The Unique Core
RADIATOR

FREE
This interesting book of facts on The Herman Nelson Invisible Radiator.

THE HERMAN NELSON CORPORATION
Moline, Illinois

Please send me your illustrated book No. 39
I am planning to build a house containing..... rooms.

Name.....

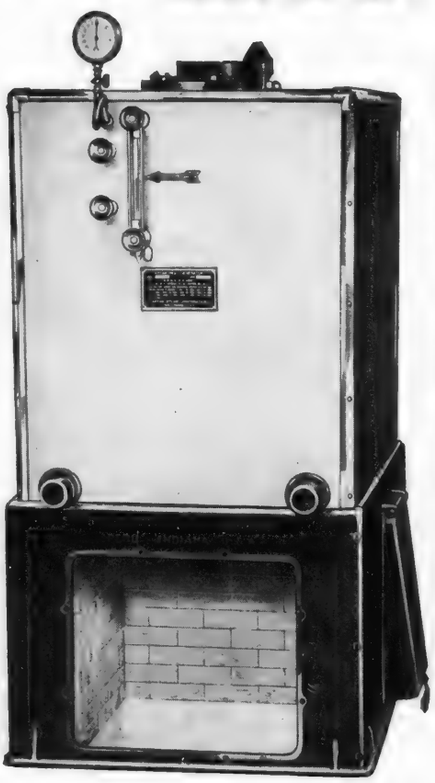
.....

Address.....

.....

The BALLYHOO—

WE ARE MAKING ABOUT BRYAN BOILERS



Unsolicited praise from Bryan users everywhere is proof enough that The Bryan Boiler is a sensation in the heating industry.

Firmly established—the only boiler of its kind—The Bryan is only in the infancy of its success.

DEALERS LISTEN!

A boiler that will save your customers from 30 to 50% of their old fuel bills. Oil burners are here to stay, but many of them have been condemned.

WHY?

Because of an inefficient boiler!

Bryan Boilers are Specifically designed to give the highest efficiency and to be the most economic in operation. HERE IS THE ANSWER TO YOUR TRADE.

A heating marvel that has every oil user as a potential prospect.

Get your 1928 franchise.

Specially designed for one sole purpose—for an oil or gas burner—The Bryan Boiler has met the trade with the best results. Small and intact, there is no heat waste. Copper tubes make almost instant circulation—The Bryan is a quick heater.

Exclusive rights granted in every trade center to heating and contracting trade.

Manufactured by

BRYAN STEAM CORPORATION

(*Boiler Division*)

PERU, INDIANA, U. S. A.

GORTON SYSTEM

of VAPOR HEATING

Going Strong!

EACH year the Gorton Single Pipe Vapor System is becoming more popular as installations in residences, apartments, and commercial buildings prove its success.

Each installation sells others, *for performance is the best reference.*

Send for full details

GORTON HEATING CORPORATION

Formerly Gorton & Lidgerwood Co.

96 Liberty Street, New York, N. Y.

Established 1887

Blake Cast Iron or Brass Water Heaters

Nothing to Compare With These Either in Price or Efficiency

K-1320 K-1325 K-1330 K-1335 Cross Section

Made to fit any size Boiler or Furnace. Heating surface one foot. Will carry 35 ft. of Radiation. Most suitable Water Back for 30 or 40 gallon Range Boiler.

Brass Cleanout at Bottom for Blowing out Sediment.

Fig. K 1320—Lengthened out for any Holes in Boiler. Fig. K 1325—2½″ Centers—K 1330—2″ Centers. K 1335—9″ Centers.

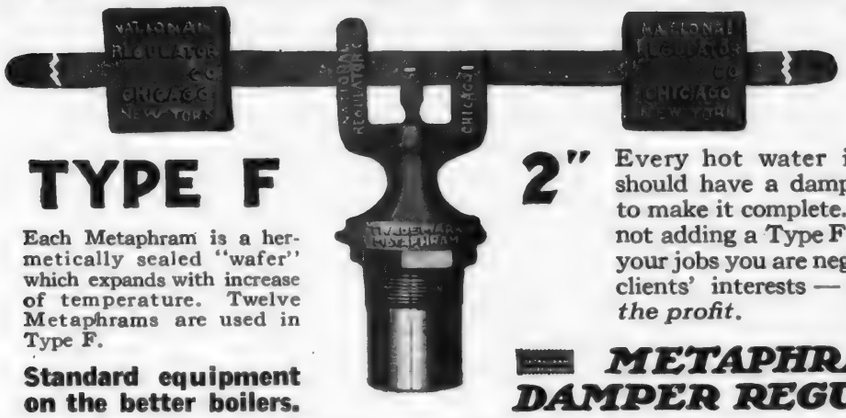
Tappings ¾ or 1 inch—Measurement 2¼x3¼x12. Weighs about 8½ lbs.

Your Jobber Will Furnish Them

BLAKE SPECIALTY CO.

ROCK ISLAND, ILL.

What Have YOU Lost?



The Ideal Damper Regulator for Closed Hot Water Systems

TYPE F

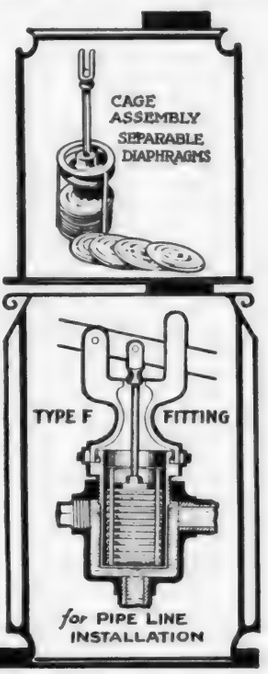
Each Metaphram is a hermetically sealed "wafer" which expands with increase of temperature. Twelve Metaphrams are used in Type F.

Standard equipment on the better boilers.

2"

Every hot water installation should have a damper regulator to make it complete. If you are not adding a Type F regulator to your jobs you are neglecting your clients' interests — and *losing the profit.*

METAPHRAM DAMPER REGULATOR



Saves fuel for the owner because it maintains even temperature by regulating the drafts. Gradual action. One of the most powerful and sensitive damper regulators. Twelve Metaphram expansion units operate in a "dry well" (which is screwed into boiler opening or in special fitting or a Y in pipe line) and which is surrounded by water. Type F operates on slight change of water temperature. Removable without draining boiler.

Make installations more satisfactory to owner and *more profitable to you.* Use Type F on new or old work.

NATIONAL REGULATOR CO.
2301 KNOX AVENUE CHICAGO
Manufacturers of the National System of Automatic Temperature Control

METAPHRAM

A Low Water Line Knows No Quality

In specifying or buying a boiler you use the utmost care in your selection and demand the best in construction, quality and efficiency. Should not the same amount of care be used in providing against the ever-present danger of low water line, a condition that knows no quality?

Boilers are safeguarded against burning or cracking when equipped with Thermo Syphon Traps. All condensation is returned to the boiler, maintaining the water line, regardless of pressure or vacuum.

As well as protecting the boilers, Thermo Syphon Traps assure proper circulation and noiseless operation. Prevent air-bound or water-logged conditions.

Send for Bulletin No. 16-HV, giving full details

THERMO SYPHON TRAP

For All Types of
Steam Heating Systems

LYTTON
MANUFACTURING CORPORATION
FRANKLIN, VIRGINIA.

ALSO HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.

OIL BURNER GULF COMPANY

Three Profitable Years

of good selling, and of excellent performance in all types of heating plants, proves the fundamental soundness of handling an Oil Burner that has behind it the engineering knowledge, manufacturing skill and merchandising ability of The Gulf Organization.

A valuable franchise, including unusual cooperation and sales helps, is available to dealers whose qualifications meet our requirements.

Write now for full details.

The Gulf Oil Burner Co.

Dept. D-1, 1627 Chestnut Street, Philadelphia, Pa.

HOUSE HEATING WITH OIL FUEL

By **P. E. FANSLER,** *Associate Editor, The Heating and Ventilating Magazine*

A representative of one of the largest oil burner manufacturers writes us:

"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

362 PAGES **MORE THAN 150 ILLUSTRATIONS** **PRICE $4.00**

Published by

HEATING AND VENTILATING MAGAZINE CO.

386 FOURTH AVENUE **NEW YORK CITY**

Service **The** **Satisfaction**

VECO SYSTEM of VAPOR HEATING

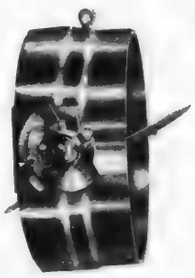
Valuable help for the contractor
Engineering service by Vapor Experts
Complete plans and specifications
Our systems fully guaranteed

VAPOR ENGINEERING COMPANY

PHILADELPHIA—10 So. 18th Street
J. Wilbur Glassey—M. S. Buck

NEW YORK—489 Fifth Avenue
Chas. E. Scott—R. C. Willis

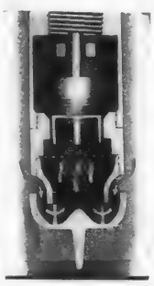
Boost the Number Of Your Burner Boosters



Preferred 100% Automatic Damper

Every oil burner equipped with the Preferred 100% Automatic Damper has a tremendous advantage over any oil burner that is not so equipped.

This Preferred Damper saves from 10 to 25% of the fuel consumption. Do not handicap your burner—allow it to do full justice to you by using this great fuel saver. It is absolutely automatic and prevents puff-backs.



Cross-section of Preferred Foot Valve

Every day the competition among oil burners is getting keener.

Every day the public is looking for and demanding economy.

Get the latest literature on this device and equip your burners with the Preferred 100% Automatic Dampers.

Preferred Utilities:

Preferred 100% Automatic Damper
Preferred Foot Valves
Preferred Anti-Syphon Valve
Preferred Double Tapped Bushings
Preferred Flush Boxes
Preferred Vent Protector
Preferred Domestic Hot Water Control Panel

Other Preferred Utilities in our laboratory and on test in the field.

PREFERRED UTILITIES MANUFACTURING CORP.

33 West 60th St., New York, N. Y.

Nokol oil heat is preferred

by the great majority of the leading automotive manufacturers and executives—by 846 prominent engineers—by 2197 leading physicians—by 427 architects—by 632 contractors—by 38,000 owners of homes, large and small. Nokol automatic oil heat is selected by practically all who make a thorough investigation of all oil burners.

If Nokol is not represented in your community and you are interested in the same thing we are—making money thru sound, progressive policies and courteous, efficient service—write us for full details of our Dealer Proposition.

NEW *Silent*

NO COAL **NOKOL**

REG. U.S. PAT. OFF.

AUTOMATIC OIL HEATING FOR HOMES

F R E E — N E W B O O K

AMERICAN NOKOL COMPANY
4207 Schubert Ave., Chicago

Please send me your new book on oil heat and details of your dealer proposition.

Oldest and soundest automatic oil burner manufacturer in the world.

Name.....

Address.....

City..... *State*.....

So easily installed

TORIDHEET
OIL BURNER
FOR BETTER HOME HEATING

TO the dealer, ease of installation is a very important factor in the choice of a burner to sell.

Toridheet is extremely easy to install and once in operation, does not eat up profits by excessive service calls.

Toridheet is tried and proved in thousands of installations throughout the country.

Noiseless, super-safe, clean, economical, fully automatic, Toridheet is easy to sell and keeps itself sold.

If you desire to establish yourself in a permanent and profitable business, write to us for details concerning our dealer proposition.

Toridheet sells for the low price of

$385.00

Complete with Operating and Safety controls. Installation costs vary with tankage capacity desired. Listed as standard by the Underwriters' Laboratories.

CLEVELAND STEEL PRODUCTS CORP.
Madison at W. 74th St. · · Cleveland, Ohio

McILVAINE OIL BURNER

Distinctly Different Mechanical Draft Burner

No Gas Pilot
No Electric Ignition

New 1928 Prices

New Attractive Proposition for Distributors Who Can Qualify

McILVAINE BURNER CORPORATION
Dept. H
749 Custer Ave., Evanston, Ill.

The Down-Draft Does It!

The downdraft principle is an exclusive, clinching argument for salesmen. Easily understood by home owners. Aladdin Oil Burners are leading in sales in many territories. Our franchise is desirable because it means profits. Write today.

ALADDIN UTILITIES CORPORATION
1222 S. Michigan Ave., Chicago, Ill.

QUIET **Aladdin**
Uniform Fuel-Oil Heat

It's Time to Line Up with the LACO

If you're planning a real oil burner business for 1928 you'll want to line up *now* with the LACO. Made in five sizes—meets all price competition and is second to none in economy of operation and freedom from bothersome service calls. GUARANTEED. Write for dealer terms and full particulars.

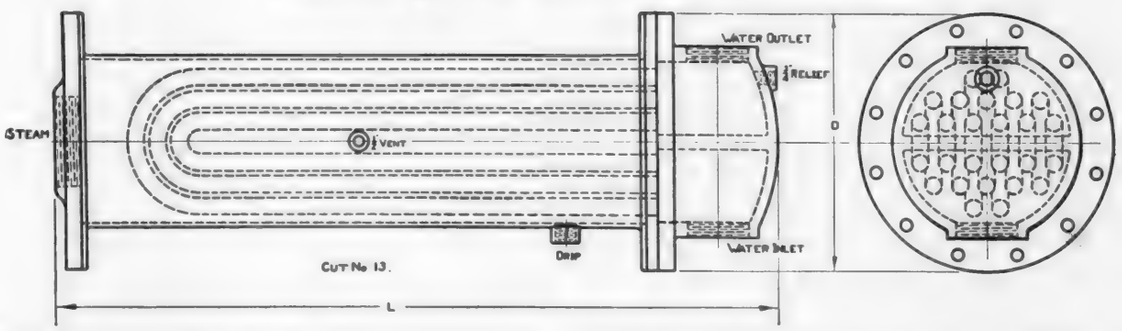
LACO GAS BURNER CO., Griswold, Iowa.

Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines
Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines Haines

NATIONAL

PREHEATERS or U BEND TYPE Condensation Coolers

soon pay for themselves in saving heat lost through discharge of heating systems



Much heat is lost in allowing the condensation discharge from the heat you buy to pass off into the sewer. By using a National Preheater or Condensation Cooler, the condensation passes through the heater where the U bend element extracts the heat still in the condensation and uses it for domestic hot water supply. You also eliminate trouble resulting from high temperature condensation emptying into the sewage system.

Furnished in All Sizes. Write for Quotations.

THE NATIONAL PIPE BENDING CO.

120 River Street, New Haven, Conn. **Boston—New York—Philadelphia**

How Central Stations "Eat Their Cake and Keep It"

Hornung "Master Control Valve" motor operated directly by thermostat. All relays eliminated.

The more customers you have, the less you lose when you lose *one*.

Put more customers on your lines, without increasing your overhead! The Hornung "Master Valve" Control, installed in the buildings you heat, will do two things:

1. Make customers better satisfied by cutting down their bills—because it will stop all *waste* of heat.
2. Give you more heat—that which is now *wasted*—with which to serve more customers.

That's how you can "Eat your Cake and Keep it"—keep all your present customers, please them better, add more customers, make your position stronger—and all with the *same output* that you are now producing.

Ask us to *prove* it to you.

"Heat lost is money lost."

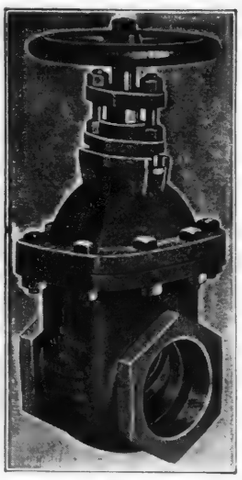
CENTRAL HEAT APPLIANCES

J. C. HORNUNG
Engineer

3569

343 S. Dearborn St., Chicago, Ill.

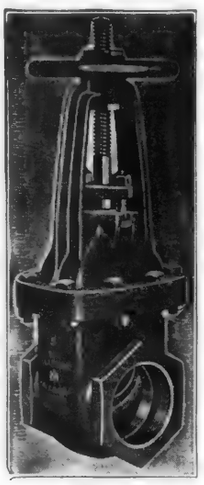
IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings



Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

"Take it from me—

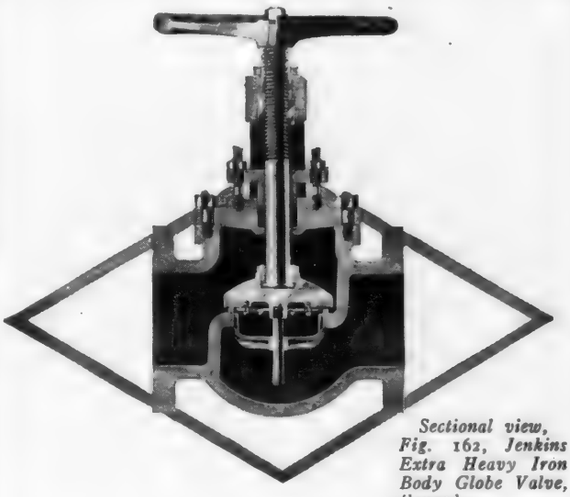
—Mason Regulators can't be beat when it comes to gettin' accurate pressure control. You can forget 'em after you put 'em in and your pressures will stay where they're set." Write for fully illustrated Catalog No. 62 showing Mason Regulators for every power and process service.

Mason No. 236
Lever Style Reducing Valve

The Mason No. 236 is specially designed for heating systems requiring accurate regulation of steam at low pressures. It is simple, positive and dependable. It is made with two sizes of diaphragms suitable for reduced pressure from 0 to 10 lbs., and from 5 to 25 lbs., respectively.

Sizes 2 to 10 inches
Initial Pressure up to 125 lbs.

Mason Regulators
MASON REGULATOR CO.
BOSTON, MASS.
1618



Sectional view, Fig. 162, Jenkins Extra Heavy Iron Body Globe Valve, flanged.

These Iron Body Valves have an "iron constitution"

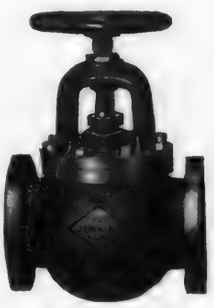


Fig. 142 Flanged Jenkins Standard Iron Body Globe Valve

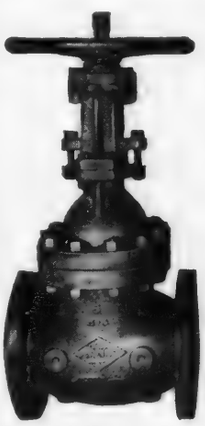


Fig. 204 Flanged, Jenkins Extra Heavy Iron Body Gate Valve

Strength is built into a Jenkins Iron Body Valve. Each valve has truly an "iron constitution."

The Jenkins "Diamond" mark on one of these valves gives a heating contractor the same assurance as the same symbol on a bronze valve. He knows that the valve on which this symbol appears will uphold his reputation for good work.

Jenkins manufacturing standards include metal analyses before and after casting, and the making of an iron body valve is a work of precision and care from beginning to end. Machining is held to close limits, assembly is painstaking, and thorough and frequent inspection is given the valves in the various stages of manufacture.

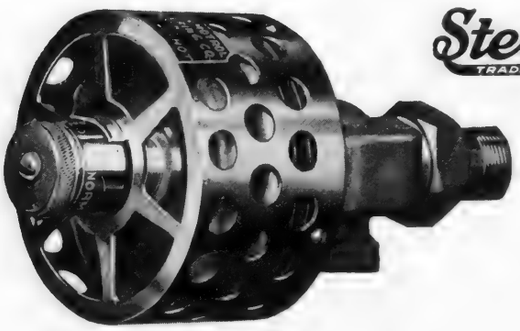
The complete valve is given a rigid final test which allows a margin of safety. Each valve before it leaves the Jenkins factory must make good under pressures higher than those for which it is recommended.

JENKINS BROS.

80 White Street.....New York, N. Y.
524 Atlantic Avenue...Boston, Mass.
133 No. Seventh St..Philadelphia, Pa.
646 Washington Blvd....Chicago, Ill.

Jenkins Bros., Limited
Montreal, Canada London, England

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864



Sterlco-Roys Thermotrol

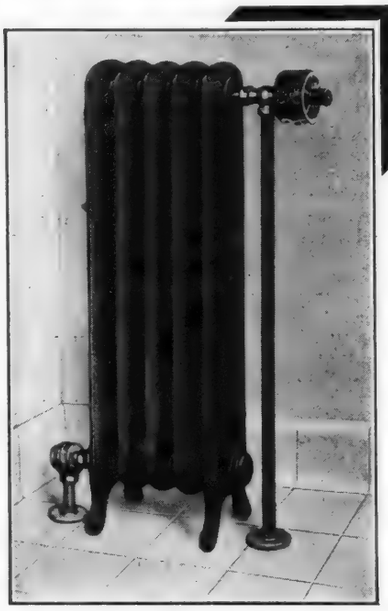
A Separate Heating Plant in Each Room

It would, of course, be impossible to have a heating plant in each room, but virtually the same thing is accomplished with the Sterlco-Roys Thermostatic Temperature Regulator. Independent of the source of heat, the Thermotrol controls accurately the heat in each room.

The Thermotrol is not operated by compressed air or electrical connections, but is connected directly to the radiator as easily as an ordinary air valve. Can be installed throughout any building, old or new, at very little expense. The valve may be rotated in the housing for either top, bottom or side feed.

It responds to the temperature of air around it, but can be regulated to control the temperature of the room. Controlled heat means health and comfort to building occupants as well as fuel economy.

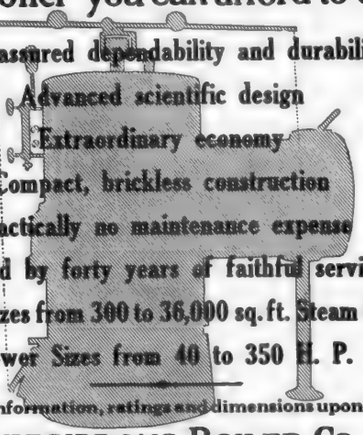
Let us send you Bulletin 39 containing details.



The Thermotrol consists of a valve installed in a supply line to the unit of radiation to be controlled by a combination of highly sensitive diaphragms These diaphragms are insulated from the heat of the radiator and enclosed in a housing. If the occupant of a room desires warmer or colder temperature the regulator can be set by turning the knob which is marked "Hot," "Normal," and "Cold."

STERLING ENGINEERING COMPANY
1640 HOLTON ST., MILWAUKEE, WIS.

FITZGIBBONS STEEL BOILERS
"The Boiler you can afford to own"



Steel-assured dependability and durability
Advanced scientific design
Extraordinary economy
Compact, brickless construction
Practically no maintenance expense
Proved by forty years of faithful service
Heating Sizes from 300 to 36,000 sq. ft. Steam Rating
Power Sizes from 40 to 350 H. P.

Complete information, ratings and dimensions upon request

FITZGIBBONS BOILER CO.
INCORPORATED
570 Seventh Ave., New York, N. Y.

Absolute Dependability since 1886

SIGN VALUE

SCOTT

A COMPLETE LINE OF BRONZE AND IRON-BODY VALVES

-built for long life

SCOTT VALVE MFG. CO.
DETROIT MICH.
"MAXIMUM SERVICE PER DOLLAR"

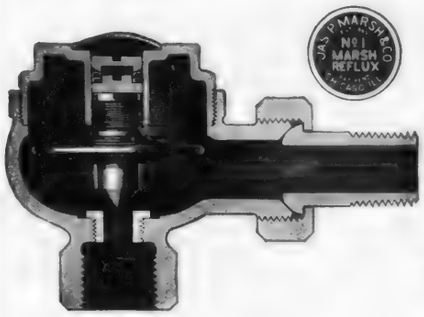
Why Use Large Domestic Coal?

You can obtain the same results at about half the price—with PYRAMID GRATES because they burn Buckwheat Coal.

Let us send you details.

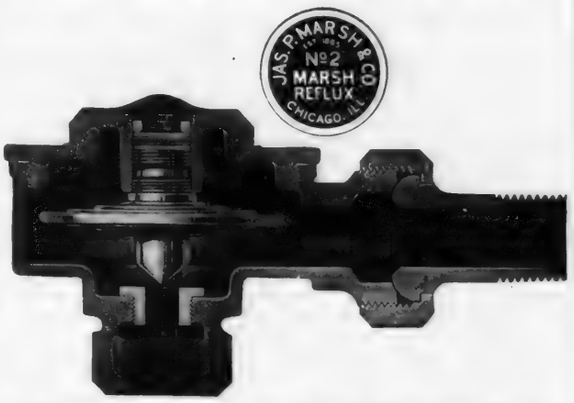
PYRAMID IRON PRODUCTS CO.
136 Liberty Street **New York City**

MARSH REFLUX THERMOSTATIC RADIATOR TRAPS



GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



The Most Economical, Practical and Efficient Trap for the Average Sized Unit

Marsh Reflux Traps assure full efficiency of Radiator Coil and System.

Automatically discharge air and the water of condensation as fast as it is formed.

The Trap closes the instant steam or vapor strikes the thermostatic diaphragm. Vapor or steam cannot pass through the Trap; therefore every atom of heat is given off in the radiator or coil.

Just one movable part—nothing loose to rattle, chatter or make a noise.

Neat in appearance, handsomely finished and heavily nickel-plated.

The Economical, Practical and Efficient Trap for Both Small and Large Units

Marsh Reflux Traps are all-metal construction including heavy cast brass body, handsomely nickel-plated and with extra heavy special tail piece.

The one movable part—a genuine phosphor bronze non-collapsible Thermostatic Diaphragm—contains the combination of volatile fluids so balanced as to, at all times, distinguish between air and water of condensation and vapor or steam. So corrugated and constructed to eliminate the slightest possibility of rupture from alternate expansion and contraction.

JAS P. MARSH & CO. 114-124 So. Clinton St. **Chicago**

ESTABLISHED 1865

62 YEARS CONTINUOUS EXPERIENCE IN MANUFACTURE OF STEAM SPECIALTIES

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents—Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario.

Free Installation Diagrams!

Whether your problem is to increase the hot water facilities in an older building—or to lay out a system for a new one—whether the building is an apartment house, a laundry, a hotel, school or restaurant—you will find among the installation diagrams shown in this valuable bulletin practical aids in the first steps toward the final selection of the unit best adapted for the situation.

"Hot Water Heating Methods", profusely illustrated with practical installation diagrams, is a bulletin which every architect, engineer and heating contractor will want in his files.

May we send you this interesting data? You incur no obligation. No Paracoil engineer will call on you unless you specifically request it. Just fill in the coupon below.

Paracoil
Water Heater

DAVIS ENGINEERING CORPORATION,
90 West Street **New York City**

DAVIS ENGINEERING CORP.,
90 West St., New York City.

Please send me your bulletin "Hot Water Heating Methods," a brief outline of practical methods in use for furnishing hot water.

Name .....

Address .....

City ..... State .....

For Satisfactory Expansion Joint Service

Guide and Anchor the Pipe Properly

AS expansion joint manufacturers, we early discovered that the proper anchoring and guiding of the pipe is essential. We therefore developed the Wainwright Guide and Anchor. These guides and anchors grip the pipe with toothed jaws similar to those used in the Stillson wrench, and they are of the most sturdy construction. When planning a pipe installation, consult our engineers.

Foster Wheeler Corporation

A Consolidation of Power Specialty Company and Wheeler Condenser and Engineering Company

165 Broadway, New York, N. Y.

Branches in All Principal Cities.

114

"We keep others in Hot Water"

Repeat Orders Reflect Satisfactory Service

Note the following copy of sales record:

Endicott-Johnson Co., Endicott, N. Y.

September, 1916	2	storage	heaters
June, 1917	2	"	"
June, 1921	2	"	"
October, 1921	1	"	"
March, 1923	2	"	"
April, 1923	1	"	"
November, 1924	1	"	"
January, 1925	1	"	"
December, 1926	2	"	"
Total	14	storage	heaters.

FURNISHED BY

THE SIMS COMPANY, Erie, Penna.

Ritz Tower, New York
Emery Roth, Architect
J. L. Murphy Co., Inc.,
Plumbing Contractors

Patterson
Hot Water Heaters

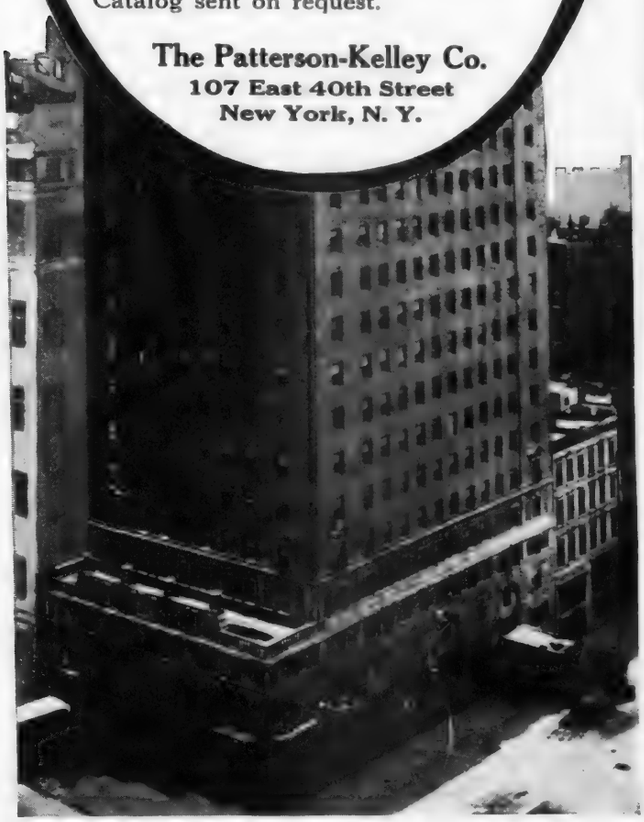
Supply Hot Water 1/10 Mile High

In the 42 story Ritz Tower—the tallest apartment hotel in the world—Patterson Hot Water Heaters are called upon to furnish hot water nearly 500 feet up in the air.

No service is too severe for the Patterson. We guarantee Patterson Hot Water Heaters to furnish all the hot water required, as hot as required and when required.

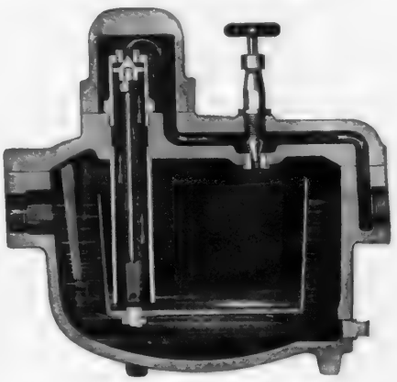
Catalog sent on request.

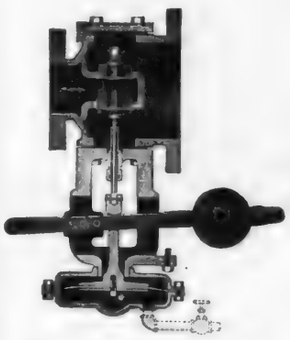
The Patterson-Kelley Co.
107 East 40th Street
New York, N. Y.



The Improved Steam Trap

Look Into the Line of





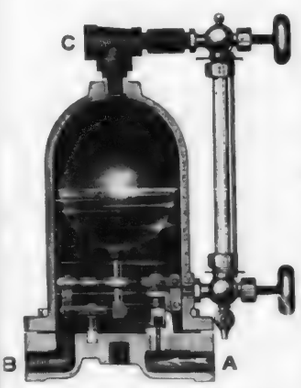
Special "98" Pressure Reducing Valve

KIELEY
REGISTERED TRADE MARK

Steam, Water, Air, Gas and Oil Specialties

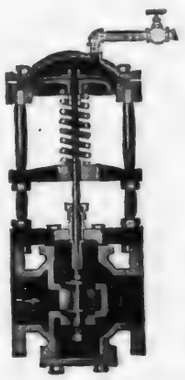
Why not turn to Kieley Specialties. Specialties that have stood the test of time and the advanced requirements in Heating Engineering for products that have proven economical and reliable. Investigate the Kieley line of products.

Write for the New No. 57 Catalog

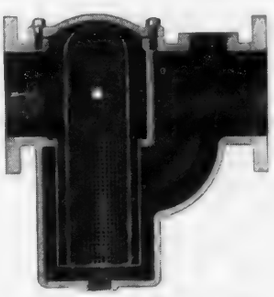


Mueller Water Feeder

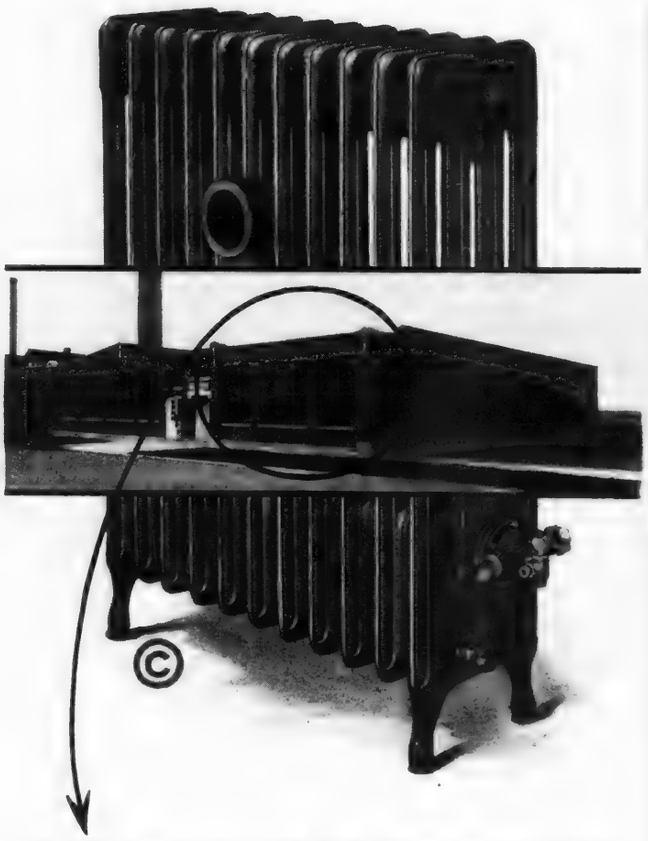
KIELEY & MUELLER
INCORPORATED
34 W. 13th St., N. Y. City



Rockaway Reducing Valve



Suction Strainers



5 Gasteam Radiators make the office independent of Factory Heating

Gustafson & Scott—1759 N. Lowell Ave., Chicago, Ill.—heat their 50 by 40 foot office with 5 Clow Gasteam Radiators.

Manufacturing processes, reinforced by a warm-air furnace, keep the factory section of the building warm. Clow Gasteam cuts over four months from this firm's central heating plant expense.

Heat is needed in factory but three or four weeks —during Winter's coldest weather. Gasteam gives the office quick economical heat, when, and where needed—daytime, or after hours—independent of the factory heating plant.

These Gasteam Radiators may solve similar heating problems for you. And Gasteam means satisfied customers, with good profits for heating contractors.

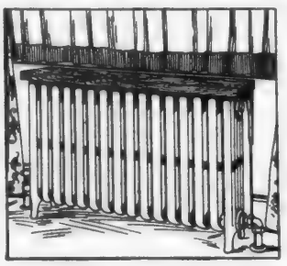
Send for our catalog

JAMES B. CLOW & SONS
201-299 North Talman Avenue, Chicago.

CLOW GASTEAM

Heating Contractors

Your Sales are Limited only by the Number of Radiator Installations.



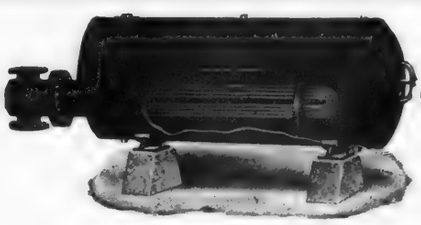
We Want Dealers

Every radiator installation is a ready and almost certain prospect for the sale of our Shields or Cabinets. You can do a big business by installing our Baked Enamel Shields and Art De Luxe Cabinets.

Proper construction permits ready circulation of both cold and hot air. Our product is made by men who are thoroughly familiar with heating and ventilating requirements. Architects are continually recommending the Acme Line.

Write for Prices and Dealer Agreement.

Acme Radiator Shield Co., Inc.
Manufacturers of "Modern" Radiator Furniture.
48 and 50 Vine Street, Cincinnati, Ohio.



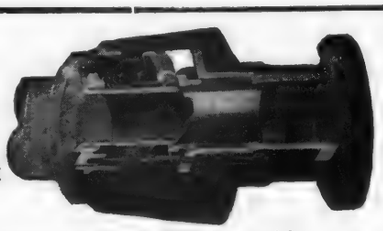
"Frank"ly

speaking O.E.F. U-Tube and Straight Tube heaters are of a decidedly efficient character. Made of flange steel throughout.

Write our engineering department for full details.

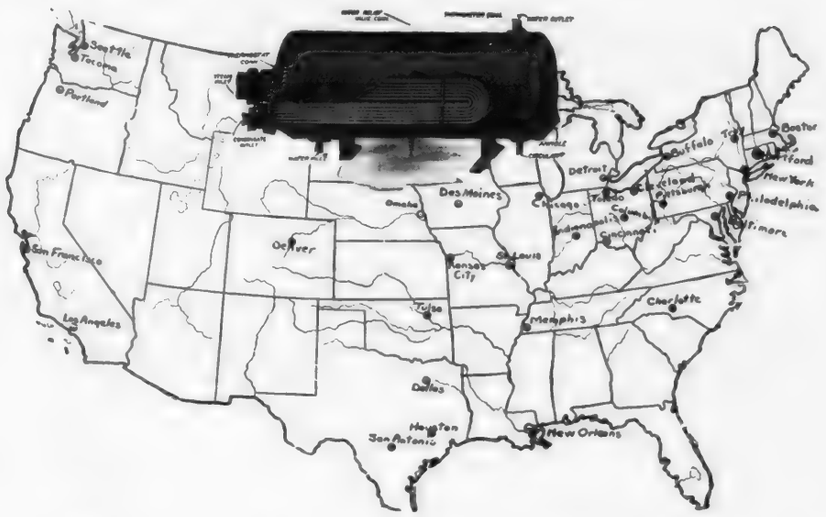
O. E. Frank Heater & Engineering Co., Inc.
Factory and Offices at Buffalo, N. Y.

ROSS Crosshead-GUIDED Expansion Joint Excels in



Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.
New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.



A National Product and Service

THE WHITLOCK COIL PIPE COMPANY

40 South St., Hartford, Conn.

New York, Boston, Philadelphia, Chicago, Baltimore, Detroit, Los Angeles, San Francisco, and other principal cities. Consult telephone book.

WHITLOCK HEAT TRANSFER PRODUCTS

THE VANDERMAN BROS. COMPANY

PLUMBING

GAS, STEAM AND HOT WATER HEATING

170 PEARL STREET

HARTFORD, CONN., Dec. 30, 1927.

"Standard"

The Vinco Company,
75 Vesey street,
New York, N.Y.

Gentlemen:

In reference to Vinco.

We have used Vinco and have always obtained the desired results in cleaning heating systems of oil and grease to prevent them from foaming or churning to hold steady water line, therefore increasing the efficiency of the heating system.

In one particular case I have saved the cost of pitting the boiler to get the clearance between the end of steam main and water line which was caused by unsteady water line and by the oil and grease in the system.

Very truly yours,

THE VANDERMAN BROS. CO.
Wm. H. Vanderman

A $500 Bill in his Pocket because he used Vinco!

THE VINCO CO., Inc.

75 Vesey Street New York, N.Y.

Use a jet for pumping out pits

Sumps, manholes, cable pits, tunnels, etc., can be kept free of storm water, drips, etc.,

by installing

AUTOMATIC WATER JET EDUCTORS

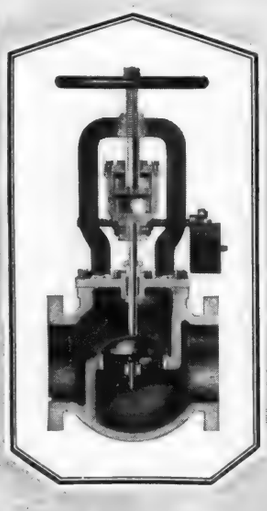
This is a 4" Automatic Eductor

These jet pumps operate with pressure water and have ball float control. They are made in 9 standard sizes, capacities 200 to 20,000 g.p.h.

Send for Bulletin 2-M

Readers of Heating and Ventilating are invited to visit our booth at the Chicago Power Show.

SCHUTTE & KOERTING CO., 1153 Thompson St., PHILADELPHIA, PA.



The Davis Stop and Check Valve permits steam to flow from boiler to header, but closes automatically should the flow be reversed. Made in globe and angle patterns, for pressures up to 350 lbs., and total temperatures to 800 degrees. Sizes 2 to 12 inches.

This valve won't leak

DAVIS Stop and Check Valves are free from the troubles of the internal dashpot. On the Davis the oil dashpot is outside and the action of the valve is visible.

This valve will not stick—scale doesn't bother it—it is always reliable and silent. You can test its operation easily by hand, and as often as you like.

Send for the Davis Catalog with complete information on the full line of Davis Valve Specialties.

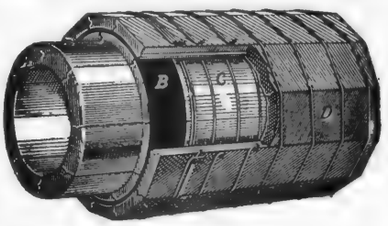
DAVIS VALVE SPECIALTIES

STEAM SAVERS SINCE 1875

G. M. DAVIS REGULATOR CO., 422 Milwaukee Avenue, Chicago, Ill.

H&V2—Gray

Wyckoff's Improved Cypress Covering

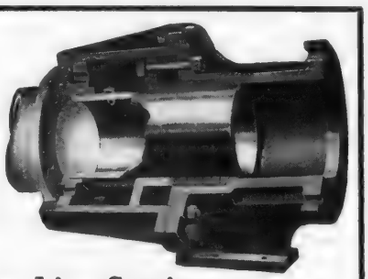


Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

HOWARD Guided Expansion Joint



For Pipe Line Service

Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

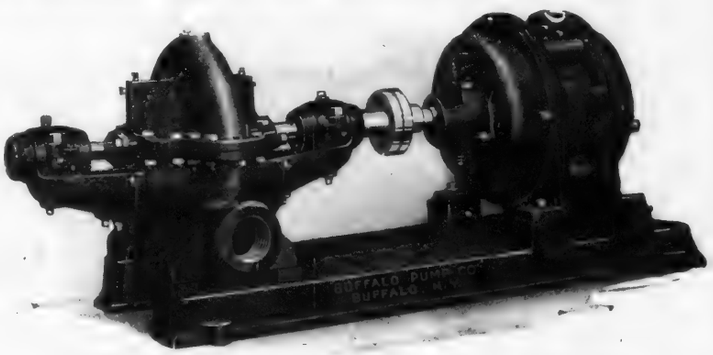
ALBERGER HEATER CO. 285 Chicago St.
HOWARD IRON WORKS Buffalo, N. Y.

"Buffalo" Double Suction Pumps

AT THE POWER SHOW— BOOTHS 123-125

"Buffalo" offers a complete line of pumps to meet any conditions of head, capacity and drive speeds. Representative pumps will be displayed for inspection at Booths 123, 124 and 125 of the Chicago Power Show. Here you can study the advanced design and carefully finished construction which have caused these pumps to be specified for so many important installations.

Branch engineering offices in principal cities, with wide experience in heating installations, are at your service.



Perfect hydraulic balance is obtained by having water enter the double suction impeller in equal volumes from opposite sides.

Buffalo Steam Pump Co.

480 Broadway Buffalo, N. Y.

In Canada:

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

New! Teesdale Automatic Oil Pump—Type L

(50-gal. Tank—Pump Capacity, 30 gals. per hour)

Now you can have a Teesdale Automatic Pumping Unit with a reserve oil capacity of 50 gals. Dependable, positive pump performance, without servicing costs to eat up your profits, is now available.

The oil pump is the same in all respects as our T U Model (illustrated to the left below). This machine with sleeve-bearing motor and spring-suspended motor armature is known among the trade as "The Quietest Pump on the Market." in fact it is practically noiseless. Pumping volume 30 gals. per hour. No valves; only three moving parts; operating cost only 15c. per 1,000 gals. pumped.

Listed as standard by Underwriters' Laboratories. Approved, Board of Standards and Appeals, N. Y.

Type T U
TEESDALE
Automatic Pump

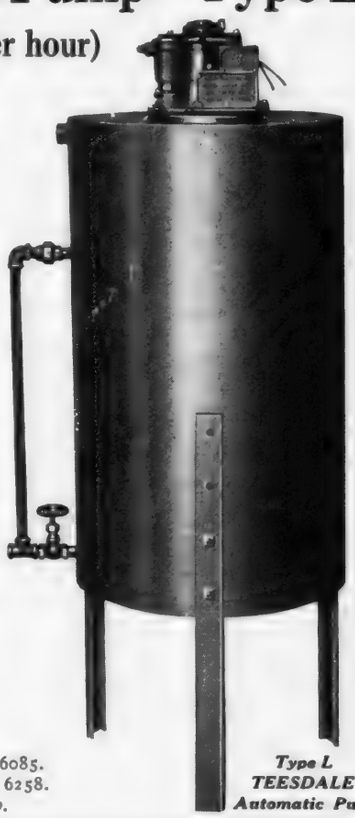
This Type L will not allow oil tank to go dry—there being always a reserve supply of 40 gals. of oil to tide the user over until his outside oil tank can be refilled.

Note the two half-inch outlet pipes and valves, as illustrated on the Type L to the right. These insure a reserve of 40 gals. of oil as long as the valve is closed.

Adjustable legs, as shown, allow a maximum clearance of 18" between tank bottom and floor. Legs, cut any dimension to your order, can also be supplied.

Tank size is 21" diameter and 30" high. Built of 16-gauge steel. One-half inch openings in top and bottom and one inch overflow are plugged in.

Finished in green and black. Not listed by Underwriters.



Type L
TEESDALE
Automatic Pump

TEESDALE MFG. CO.
429 Market Street
Grand Rapids, Michigan

New York Branch: 30 *Church Street. Phone, Cortlandt* 6085.
Philadelphia Branch: 3931 *N. Broad St. Phone, Wyoming* 6258.
Seattle, Wash.: Terminal Sales Bldg., Harrison Sales Co.

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.
Spencer Turbine Co., The, Hartford, Conn.

AIR CONDITIONING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sinclair Equipment Corp., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.
York Heating & Ventilating Corp., Phila., Pa.

AIR COOLING & DRYING SYSTEMS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

AIR ELIMINATORS
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

AIR FILTERING UNITS
American Blower Co., Detroit, Mich.
Connor Co., Inc., The W. B., New York.
DeBothezat Impeller Co., Inc., New York
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Spray Engineering Co., Boston, Mass.

AIR SEPARATORS
Bishop & Babcock Sales Co., Cleveland, Ohio.
Swartwout Co., The, Cleveland, Ohio.

AIR WASHERS
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

BELTING
Graton & Knight Co., Worcester, Mass.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BLOWERS, PRESSURE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BLOWERS, ROTARY
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BLOWERS, TURBINE
Buffalo Forge Co., Buffalo, N. Y.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

BOILER CEMENT
Johns-Manville Corp., New York.

BOILER COMPOUNDS
Vinco Co., Inc., New York.

BOILERS, DOWN-DRAFT
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Moloy Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, GAS-FIRED
American Radiator Co., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, HEATING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Bryan Steam Corp., Peru, Ind.
Burnham Boiler Co., Irvington, N. Y.
Coatesville Boiler Works, Coatesville, Pa.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corporation, New York.
Heggie-Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Johnston Brothers, Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Moloy Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Richmond Radiator Co., New York.
Spencer Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., The, Newark, N. J.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

BOILERS, MAGAZINE FEED
Gorton Heating Corporation, New York.
Moloy Boiler Co., New York.
Spencer Heater Co., Williamsport, Pa.

BOILERS, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Johnston Brothers, Inc., Ferrysburg, Mich.

BOILERS, POWER
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Heggie-Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

CONCRETE INSERTS
Gleockle, Jr., A. F., Rochester, N. Y.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS
Badger & Sons Co., E. B., Boston, Mass.

COPPER KETTLES
Badger & Sons Co., E. B., Boston, Mass.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT
Buckeye Blower Co., The, Columbus, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
Pecco, Inc., St. Louis, Mo.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., The, Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Foster Wheeler Corporation, Carteret, N. J.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

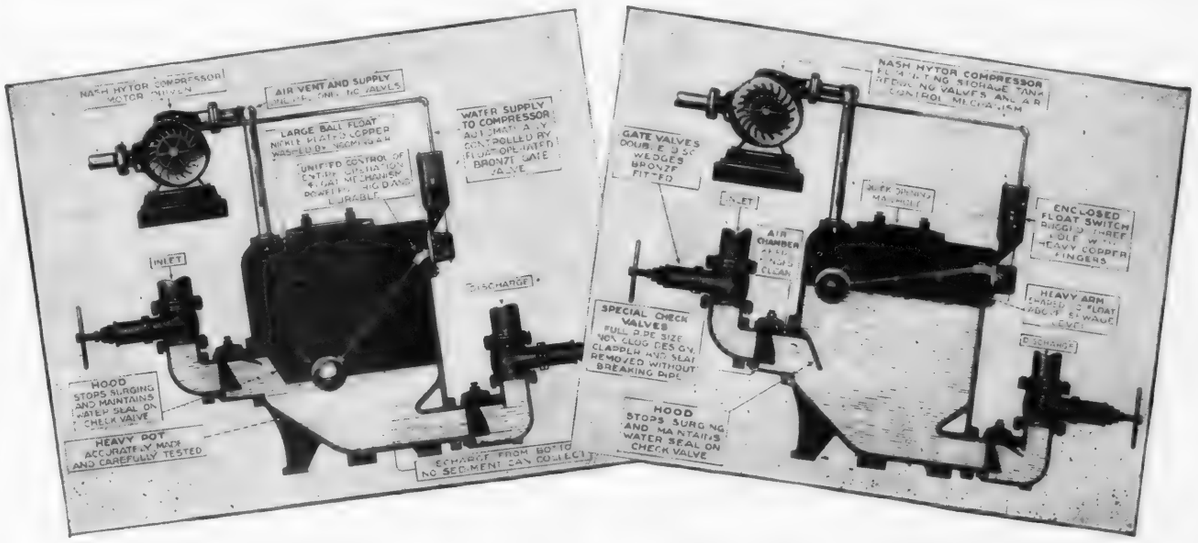
FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, DISTRIBUTOR
Blake Specialty Co., Rock Island, Ill.


AIR VENT AND SUPPLY
WATER SUPPLY TO COMPRESSOR
LARGE BALL FLOAT
INLET
DISCHARGE
HOOD STOPS SURGING AND MAINTAINS WATER SEAL ON CHECK VALVE
HEAVY POT ACCURATELY MADE AND CAREFULLY TESTED
NASH HYTOR COMPRESSOR
GATE VALVES
ENCLOSED FLOAT SWITCH
HEAVY ARM
SPECIAL CHECK VALVES
HOOD STOPS SURGING AND MAINTAINS WATER SEAL ON CHECK VALVE

Read how this sewage ejector works

Sewage, under the action of gravity, flows through the inlet check valve into the pot. As it accumulates, it raises a ball float, which, when the pot is full, actuates a float switch, starting up the Nash Air Compressor.

Compressed air is delivered into the top of the pot, closing the inlet check valve and expelling the sewage through the outlet check valve. When the pot has been emptied, the float, having reached the lower limit of its travel, opens the float switch, stopping the compressor, through which, then, the air in the pot is vented.

Sewage again flows by gravity into the pot, repeating the cycle.

Notice that there are no complicated air valve mechanisms —no screens, separators, storage tanks, reciprocating compressors, or inaccessible parts. Operation is simple—an advantage that contributes to reliability and economy.

Write for Bulletin No. 67.

NASH ENGINEERING COMPANY

81 Wilson Road, South Norwalk, Conn.

Jennings Pumps

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.

FLANGES
Clow & Sons, James B., Chicago, Ill
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, ASBESTOS
Jenkins Bros., New York.
Johns-Manville Corp., New York.

GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

GAUGES, DRAFT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRILLES
Metalace Corporation, Boston, Mass.

HEAT CABINETS
Circulair Heat, Inc., Louisville, Ky.
Clow & Sons, James B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Metal Stamping Co., Long Island City.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Blake Specialty Co., Rock Island, Ill.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Corp., Kewanee, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
National Steel Tank & Mfg. Co., Bradford, Ill.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Thatcher Co., The, Newark, N. J.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Typhoon Fan Co., New York.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.
Thatcher Co., The, Newark, N. J.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Universal Humidifier Corp., Philadelphia, Pa.
York Heating & Ventilating Corp., Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

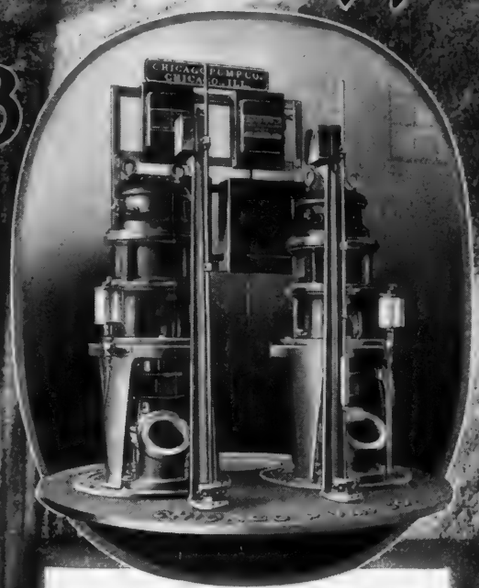
INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Insulite Co., Minneapolis, Minn.
Johns-Manville Corp., New York.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

at the Show
Booths 1-2-3

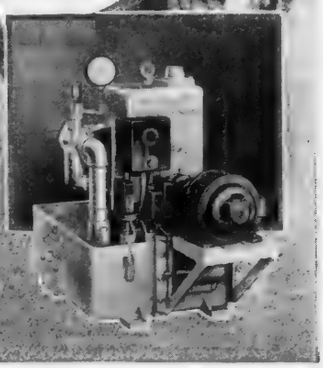


Again "Chicago" Pumps will play a prominent part in the current pageant of Mechanical progress. The Chicago Power Show at the Coliseum, February 14 to 18, will have an unusually interesting exhibit of "Chicago" Pumps.

The giant "Flush Kleen" Sewage Ejector with its self-cleaning screen and Automatic Alternator" will be the center of interest. . . . . The new "Condo-Vac" condensation-vacuum pump will also attract much attention with its many points of superiority.

The entire line of "Chicago" Pumps will be represented in this display.

See the "Flush Kleen" and the "Condo-Vac" in actual opertion



CHICAGO PUMP COMPANY

SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

2336 Wolfram Street, Chicago 1 Madison Avenue, New York

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.
Spray Engineering Co., Boston, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Lincoln Electric Co., Cleveland, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Aladdin Utilities Corp., Chicago, Ill.
American Nokol Co., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Cleveland Steel Products Co., Cleveland, Ohio.
Gulf Oil Burner Co., Philadelphia, Pa.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Laco Gas Burner Co., Griswold, Iowa.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Petroleum Heat & Power Co., New York.
Sundstrand Engineering Co., Rockford, Ill.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill

OIL BURNER EQUIPMENT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Grant Accessories Corp., New York.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Monroe Machine Tool Co., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Teesdale Mfg. Co., Grand Rapids, Mich.
Webster Electric Co., Racine, Wis.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Federal Gauge Co., The, Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Webster Electric Co., Racine, Wis.

OZONE APPARATUS
United States Ozone Co., Chicago, Ill.

PANELS, ACCESS
Higgin Mfg. Co., Newport, Ky.

PIPE, CAST IRON
Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE HANGERS
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.

PIPE THREADING & CUTTING MACHINES
National Pipe Bending Co., New Haven, Conn.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
General Air Filters Corp., New York.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
General Air Filters Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Monroe Machine Tool Co., Chicago, Ill.

PUMPS, ROTARY
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, TURBINE
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Economy Pumping Machinery Co., Chicago, Ill.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.

RADIATOR ENCLOSURES OR SHIELDS
Acme Radiator Shield Co., Cincinnati, Ohio.
American Metal Products Corp., St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Gleockle, Jr., A. F., Rochester, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

RADIATORS, BRASS
Circulair Heat, Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.

RADIATORS, GAS HEATED
Clow & Sons, James B., Chicago, Ill.

RADIATORS, STEAM & WATER
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Molby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Richmond Radiator Co., New York.
Thatcher Co., The, Newark, N. J.
United States Radiator Corp., Detroit, Mich.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

REGULATORS, TEMPERATURE
(See Temperature Control).

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., The, Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Seymour, James M., Newark, N. J.

SPRAY NOZZLES
(See Nozzles, Spray).

STRAINERS, OIL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monroe Machine Tool Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

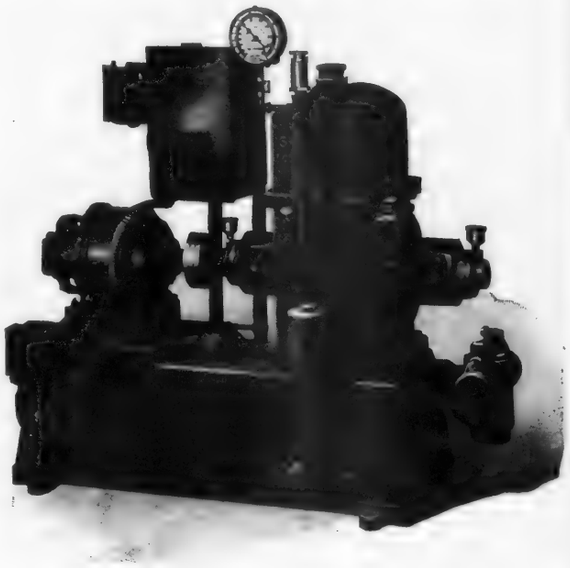
STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

TEMPERATURE CONTROL
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Raymond, F. I., River Forest, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

THERMOMETERS, RECORDING & INDICATING
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

THERMOSTATS
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 5 illustrating this unit is now available.

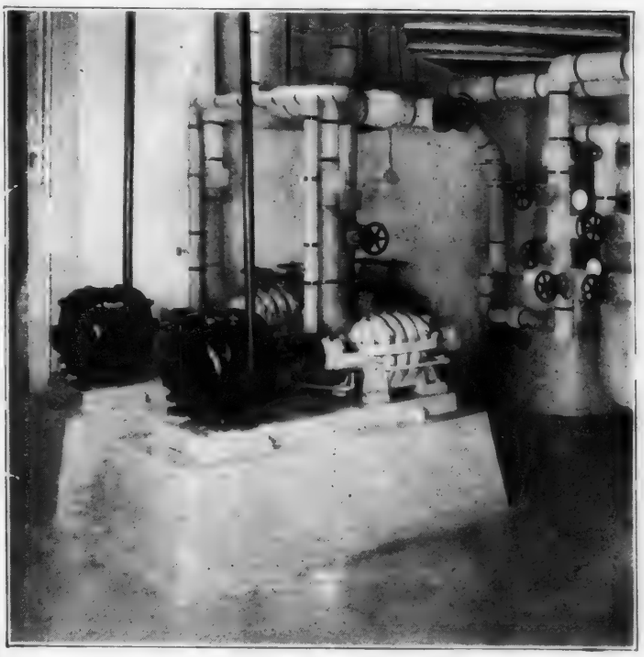
SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.

Representatives in principal cities

Canadian Representatives, Darling Bros., Limited
120 Prince Street, Montreal



A corner of pump room in Union National Bank, Wichita, Kansas, showing some of the Economy Equipment.

Chosen . . .
as Competent to Serve
Kansas' Largest and Finest Building

Economy Pumps are equal to the task required, no matter how big. Proof of this fact, shown by past performance, was convincing enough to win the builders of the new Union National Bank of Wichita, Kan.

This bank building, the largest and most imposing structure in the entire state, is equipped throughout with Economy Pumps. They are used for high pressure water supply, sewage pumping, vacuum heating, etc. Economy Pumps effect large savings in maintenance and power costs because they operate for years without interruption. For this reason they are used in many of the country's finest buildings.

When you install an Economy Pump, the cooperation of Economy engineers goes with it to assure satisfaction. Write for bulletins on the types of pump you need.

Economy Pumping Machinery Company
3431 West 48th Place, Chicago
Representatives in Principal Cities—Telephone & address under Economy Pumping Machinery Co.

Economy Pumps

Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

TRAPS, BUCKET

Swartwout Co., The, Cleveland, Ohio.

TRAPS, FLOAT

Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Works, Three Rivers, Mich.

TRAPS, LIFTING

Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Works, Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNDERGROUND PIPE CONDUITS

American District Steam Co., North Tonawanda, N. Y.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Russell & Co., W. A., New York.
United States Radiator Corp., Detroit, Mich.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corporation, New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Sarco Co., Inc., New York.
Scott Valve Mfg. Co., Detroit, Mich.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, BALANCED

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., The, Cincinnati, Ohio.

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
United States Radiator Corp., Detroit, Mich.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Typhoon Fan Co., New York.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford, Pa.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson Co., Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corp., St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson Co., Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow & Sons, James B., Chicago, Ill

WEATHER STRIPS, METAL

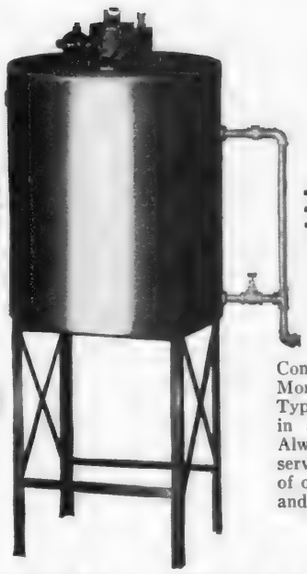
Athey Co., Chicago, Ill.
Higgin Mfg. Co., Newport, Ky.

WELDERS, ELECTRIC ARC

Lincoln Electric Co., Cleveland, Ohio

WRENCHES, STILLSON

Walworth Co., New York.



List $100.00

Type TJF

Consists of the sturdy Monroe Oil Pump Type TJU mounted in a 50-gallon tank. Always carries a reserve of 35 gallons of oil between the top and bottom outlets.

NEW RESOURCES—NEW FACILITIES Behind Monroe Oil Pumps

MONROE Oil Pumps are now in a stronger position than ever to retain their leadership in production and sales. The resources and manufacturing facilities of the Janette Manufacturing Co. have been thrown behind these pumps, which will now be produced in the seven-story Janette plant. New modern Janette machinery, plus all specialized Monroe equipment will be devoted to their production.

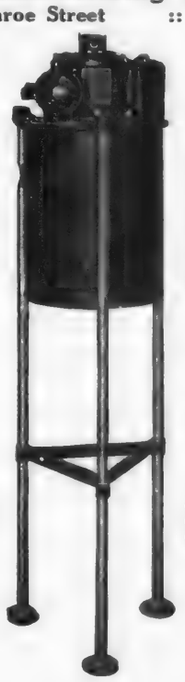
The same highly trained workmen who have produced Monroe Oil Pumps for years will continue to make them, assuring a continuance of the established Monroe standards of workmanship.

Write today for information on the complete line of Monroe Oil Pumps and Strainers.

Janette Manufacturing Company
556-58 West Monroe Street :: CHICAGO

Singer Bldg., 149 Broadway New York.

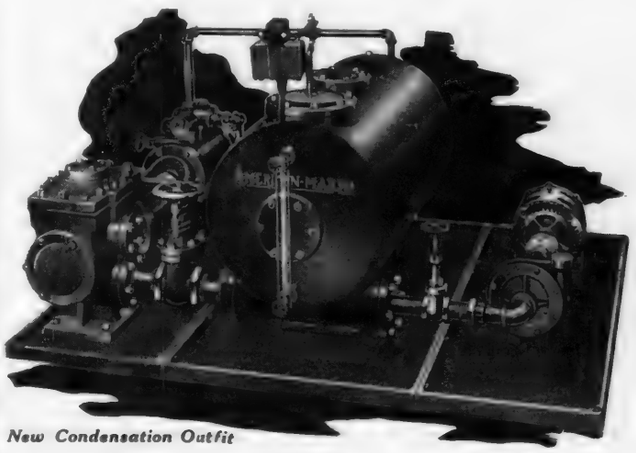
Real Estate Trust Bldg., Philadelphia.



List $75.00

Type TJU

A fast-selling pump designed for use with a single oil burner. Entirely automatic. Capacity 15 gallons. Ruggedly built — standardize on TJU's for home installations and cut service costs.



New Condensation Outfit

THE RIGHT ANSWER

to a great many heating problems

ON jobs where there will be a wide variation in steam pressure between day and night service, the new American - Marsh condensation outfit shows much better results.

Note that it is equipped with both a steam and centrifugal pump. When the steam pump stops, due to lack of pressure, the motor-driven centrifugal pump starts automatically and keeps the returns open until enough steam is again generated to operate the steam pump. This means rapid heating on cold mornings—no time lost endeavoring to clear flooded lines.

This new outfit is characteristically American-Marsh—well designed, extra sturdy construction. Sizes to meet all requirements. Write for Bulletin No. 58.

AMERICAN MARSH PUMPS

- Steam and Centrifugal
- Boiler Feed
- Vacuum
- Condensation
- Circulating
- Booster
- Fire
- Sewage Handling

AMERICAN-MARSH

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN, U. S. A.

Pumping Equipment

ALPHABETICAL INDEX OF ADVERTISEMENTS

A

Absolute Con-Tac-Tor Corp..... 32
Acme Radiator Shield Co., Inc.. 182
Aeolus Dickinson 150
Aerofin Corporation 50
Aladdin Utilities Corp..... 174
Alberger Heater Co..... 184
Alexander Bros., Inc..... 49
American Blower Co..... 141
American Boiler Mfrs. Ass'n..... 4
American District Steam Co..... 45
American Metal Products Corp... 136
American Nokol Co..... 173
American Radiator Co..28, 44, 59, 149
American Schaeffer & Budenberg Corp. 160
American Steam Pump Co..... 193
American Temperature Indicating Co. 162
Ames Pump Co..... 131
Armstrong Machine Works..... 51
Athey Co. 24
Atlas Valve Co..... 164
Automatic Burner Corp..... 29
Autovent Fan & Blower Co..... 135

B

Badger & Sons Co., E. B..... 41
Banner Rock Products Co..... 38
Barnes & Jones..... 63
Bayley Blower Co..... 159
Bishop & Babcock Sales Co..... 147
Blake Specialty Co..... 170
Bristol Co. 154
Brownell Co. 168
Bryan Steam Corp..... 170
Buffalo Forge Co..... 143
Buffalo Steam Pump Co..... 185
Burnham Boiler Corp..... 158

C

Capitol Brass Works..... 160
Carrier Air Conditioning Co. of America 143
Carrier Engineering Corp..... 136
Cashin Co., W. D..... 158
Central Station Steam Co..... 160
Century Electric Co..... 48
Chace Valve Co., W. M..... 160
Chicago Pump Co..... 189
Circulair Heat, Inc..... 43
Cissell Mfg. Co., W. M..... 166
Clarage Fan Co..... 2
Cleveland Gas Burner & Appliance Co. 16
Cleveland Steel Products Co..... 174
Clow & Sons, James B..... 182
Coatesville Boiler Works..... 8

D

Davis Engineering Corp..... 179
Davis Regulator Co., G. M..... 184
DeBothezat Impeller Co..... 140
Dunham Co., C. A..... 58
Dwyer Equipment Co..... 47

E

Economy Pumping Machinery Co. 191
Emerson Electric Mfg. Co..... 144
Excelso Products Corp..... —

F

Federal Gauge Co..... 46
Fitzgibbons Boiler Co..... 178
Foster Wheeler Corp..... 180
Foxboro Co., Inc..... 158
Frank Heater & Engineering Co., Inc., O. E..... 182
Frost Mfg. Co..... 13
Fulton Sylphon Co..... 137

G

General Air Filters Corp..... 150
Gleockle, Jr., A. F..... 152
Gorton Heating Corp..... 170
Grant Accessories Corp..... —
Graton & Knight Co..... 148
Grinnell Co., Inc..... 139
Gulf Oil Burner Co..... 172

H

Haines & Co., Wm. S..... 175
Hardinge Brothers Co., Inc..... 31
Hartmann Co., Chas..... 148
Healy-Ruff Co. 138
Heat Transfer Products, Inc..... 40
Heggie-Simplex Boiler Co..... 66
Hoffman Specialty Co..... 196
Hornung, J. C..... 176
Horton Mfg. Co..... 146

I

Illinois Engineering Co..... 62
Illinois Malleable Iron Co..... 176
Insulite Co. 37
International Heater Co..... 10

J

Janette Mfg. Co.....25, 193
Jenkins Bros. 177
Johns Manville Corp..... 35
Johnson Co., S. T..... 26
Johnson Fan & Blower Co..... 144
Johnson Service Co..... 68
Johnston Brothers, Inc..... 169

K

Kelly Brass Works..... 168
Kewanee Boiler Co..... 3
Kieley & Mueller, Inc..... 181
Knowles Mushroom Ventilator Co. 142, 144

L

Laco Gas Burner Co..... 174
Lakeside Co. 152
Lincoln Electric Co..... 52
Lytton Mfg. Co..... 171

M

Marsh & Co., Jas. P..... 179
Marsh Valve Co..... 42
Mason Regulator Co..... 177
McAlear Mfg. Co..... 167
McIlvaine Burner Corp..... 174
McQuay Radiator Corp..... 56
Mears-Kane-Ofeldt, Inc. 167
Metalace Corporation 54
Metal Stamping Co..... 166
Midwest Air Filters, Inc..... —
Milwaukee Valve Co..... 61
Minneapolis-Honeywell Regulator Co. 64
Modine Mfg. Co..... 153
Molby Boiler Co..... 166
Monitor Boiler Co..... 19

N

Nash Engineering Co.....134, 187
National Air Filter Co..... 161
National Pipe Bending Co..... 175
National Regulator Co..... 171
National Steel Tank & Mfg. Co.. 168
National Tube Co..... 22
Nelson Corp., Herman.....150, 169
New York Blower Co..... 157
Nu-Way Corp. 33

O

Orr & Sembower, Inc..... 12

P

Pacific Steel Boilers Corp..... —
Page Boiler Co., Wm. H..... 7
Patterson-Kelley Co. 181
Pecco Incorporated 146
Peerless Unit Ventilation Co..... 156
Petroleum Heat & Power Co..... 34
Phillips Drill Co..... 164
Pierce, Butler & Pierce Mfg. Corp. 6
Powell Co., Wm..... 154
Powers Regulator Co..... 129
Preferred Utilities Mfg. Corp.... 173
Pyramid Iron Products Co..... 178

R

Raymond, F. I..... 148
Reed Air Filter Co., Inc..... 57
Richmond Radiator Co.....17, 23
Ric-wiL Co. 36
Rome Brass Radiator Corp..... 18
Rome-Turney Radiator Co..... 150
Ross Heater & Mfg. Co..... 182
Russell & Co., W. A..... 60

S

Sarco Co. .....Front Cover
Schutte & Koerting Co..... 184
Scott Valve Mfg. Co..... 178
Seymour, James M..... 146
Shaw-Perkins Mfg. Co..... 14
Simplex Heating Specialty Co... 164
Sims Co. 180
Sinclair Equipment Corp..... 53
Skidmore Corp. 191
Skinner Bros. Mfg. Co..... 145
Spencer Heater Co..... 9
Spencer Turbine Co..... 194
Spray Engineering Co..... 152
Stanwood Corp. 11
Sterling Engineering Co..... 178
Sturtevant Co., B. F..... 133
Sundstrand Engineering Co..... 27
Swartwout Co. 164

T

Teesdale Mfg. Co..... 185
Thatcher Co. 15
Thermal Appliance Co..... 20
Thermal Units Co.....Insert
Thrush & Co., H. A..... 39
Titusville Iron Works Co..... 5
Trane Co. 55
Typhoon Fan Co..... 142

U

United States Ozone Co..... 165
Universal Humidifier Corp..... 154

V

Vapor Engineering Co..... 172
Ventilating Products Co..... 146
Vinco Co., Inc..... 188

W

Walworth Co. 21
Want Ads 142
Webster & Co., Warren..... 65
Webster Electric Co..... 30
Weil-McLain Co. 195
Whitlock Coil Pipe Co..... 188
Wing Mfg. Co., L. J..... 151
Wolverine Tube Co..... 155
Wyckoff & Son Co., A..... 184

Y

York Heating and Ventilating Corp. 163

Equitable Trust Company Building
New York City
Trowbridge & Livingston, Architects.

SPENCER
CENTRAL
CLEANING
SYSTEMS

Another New York Skyscraper Adopts SPENCER

New York is a big city, but recommendations travel just as fast as in a small town. That's why so many of the big buildings are Spencer Cleaned. In almost equal pace with the ever increasing number of skyscrapers you will find Spencer installations—and in other cities as well as New York.

The cleaning of the offices in the Equitable Trust Company Building, one of our most recent installations, presents a big problem, but the adoption of the Spencer Central Cleaning System is a real solution.

It is not only a compliment to be selected for such a building, modern to the last detail, but surely is a big recommendation.

We have presented the result of Spencer efficiency, now let our engineering department show you in detail how it is accomplished. There will be no obligation whatever.

The Spencer Turbine Company
Hartford, Conn.

Fable of the Flies and the Honey Pot

Some flies were once attracted to an open honey jar. Desiring its sweetness, they thoughtlessly placed their feet in the honey the better to eat it, and soon their feet became entangled and they were suffocated.

—*Aesop's Fables*

It is sometimes true that heating contractors, desiring business, will thoughtlessly go after a job with nothing but price to offer. They do not realize the entanglements of price competition until too late.

The thoughtful fellow adopts a different plan. He submits more than price with his bid. He also sells such distinctive quality features as Weil-McLain corrugated heating surfaces, long back-and-forth fire travel, and scientific combustion.

Because people, as a rule, want dependable quality, this fellow gets most of the choice jobs, on the basis of a worth-while profit—eventually building for himself a reputation and a business success.

WEIL-McLAIN COMPANY

Manufacturing Division
Michigan City, Indiana

Executive Offices
Chicago, Illinois

Fight fuel waste with

Weil-McLain

SCIENTIFIC COMBUSTION

BOILERS

in 1928

"SEE THE WEIL-McLAIN JOBBER IN YOUR TERRITORY"

for-1928

Another Hoffman

MOTION PICTURE

HOFFMAN Specialty Company announces a second and entirely new motion picture, "Controlled Heat", in 4 unusual, interesting, exciting reels.

The many thousands in the heating industry who last year saw the first Hoffman film, "The Heat Thief", with Ann Pennington, will understand that this *new* 1928 film is not only highly entertaining but unusually instructive as well.

Genuine enthusiasm greeted "The Heat Thief" wherever it was shown. Many men in the heating trades asked us, "Why don't you produce a film like this on Hoffman Controlled Heat"?

Thus, from the heating men themselves came the big idea for the second Hoffman motion picture.

"Controlled Heat" is full of drama, good natured humor and absorbing information. And best of all, this unusual motion picture shows how a perfect Vapor Vacuum Heating System operates and how it should be sold.

You will surely want to see this motion picture when it is shown in your city. Exhibition schedules are now being arranged. Write for the date and full details of the showing in your city.

HOFFMAN SPECIALTY COMPANY Inc.,
Dept. C-35, 25 West 45th Street
New York City